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# Machine Shop

January, 1929

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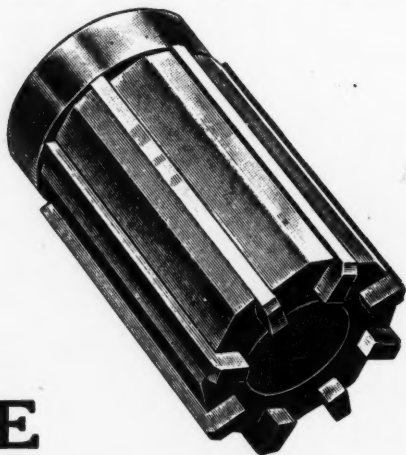
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A Shop Practice Magazine

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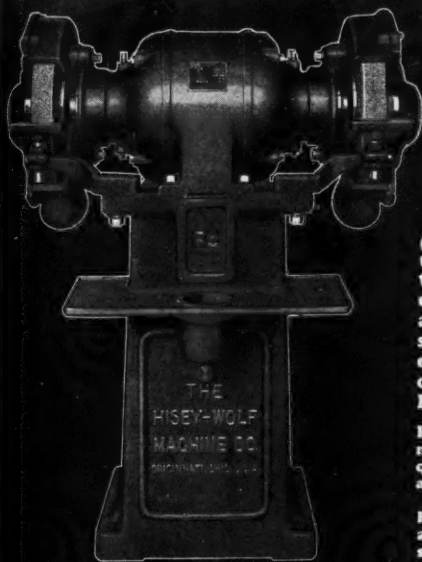
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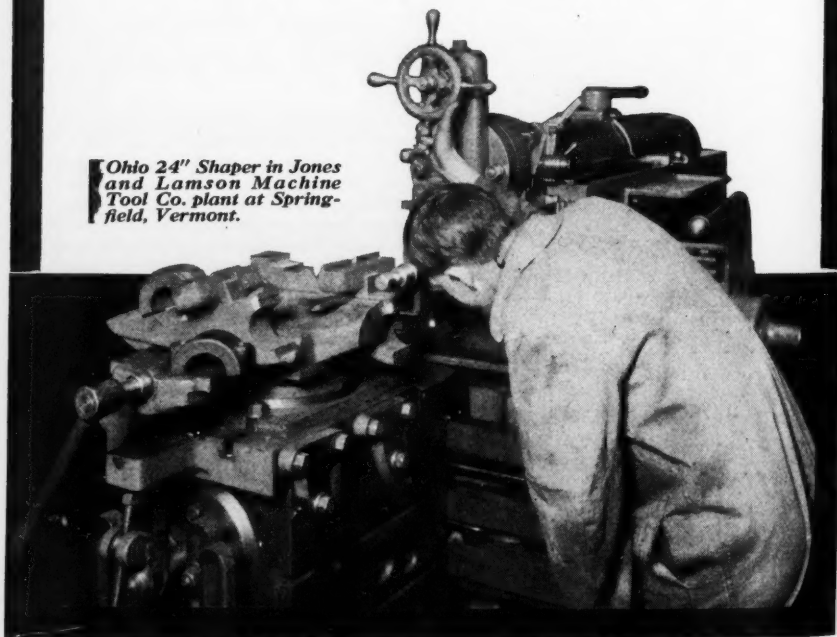
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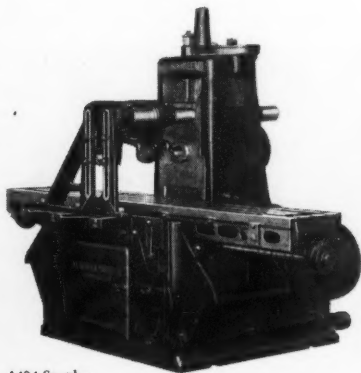




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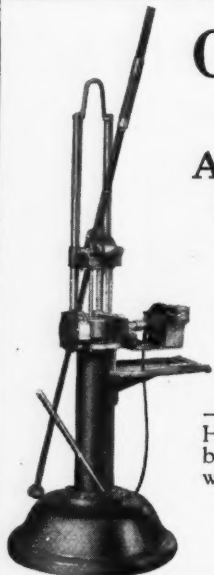
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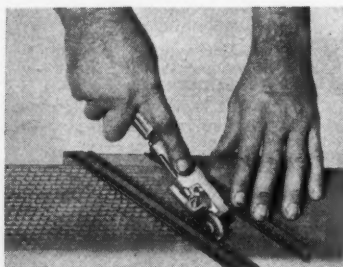


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# MODERN Machine Shop

A MAGAZINE FOR MACHINE SHOP EXECUTIVES

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JANUARY, 1929

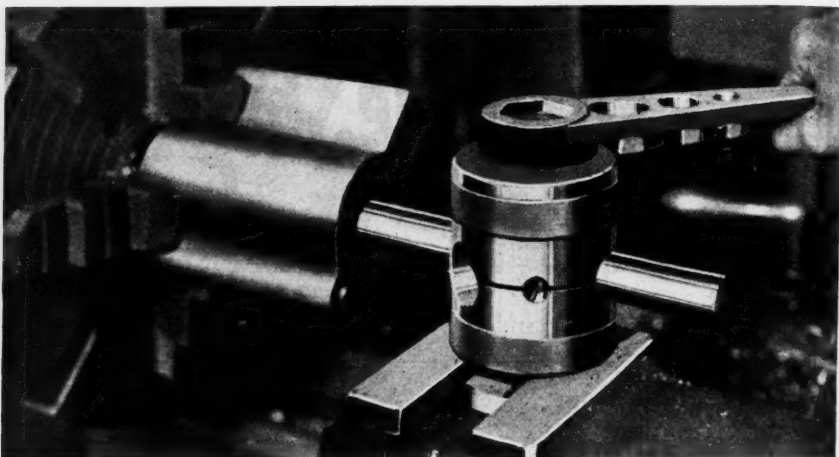
No. 8

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# MODERN Machine Shop

JANUARY, 1929

CINCINNATI, OHIO

Vol. 1, No. 8

## Machining Parts for Hart-Parr Tractor Engines

*By WREN A. DAWSON*

**I**N ORDER to withstand the harsh treatment to which they are subjected in service, parts for tractor engines must be of heavy construction

and accurately machined. At the plant of the Hart-Parr Company, Charles City, Iowa, these requirements, together with the necessity for quantity

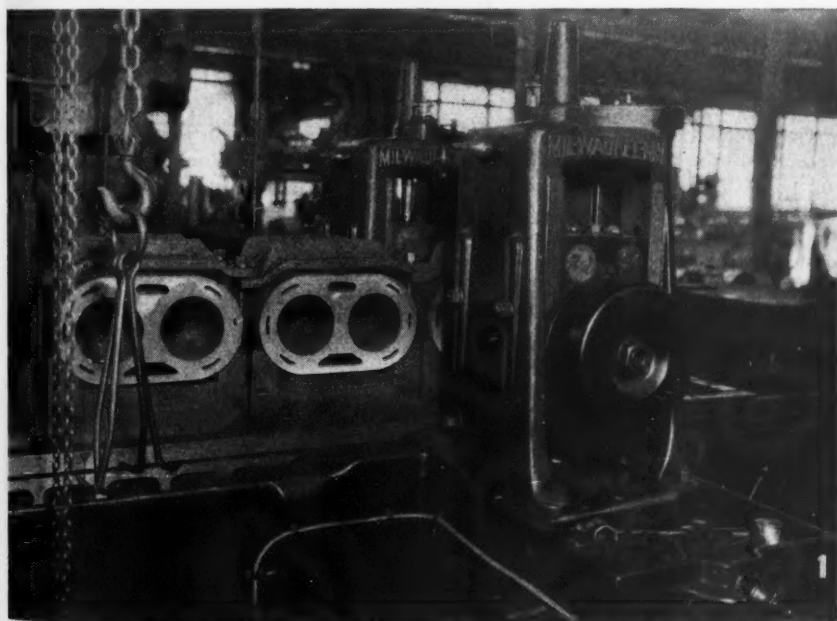


Fig. 1—The ends of the cylinder blocks are machined in a Milwaukee miller.

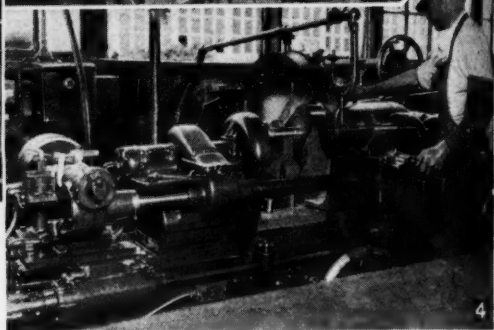
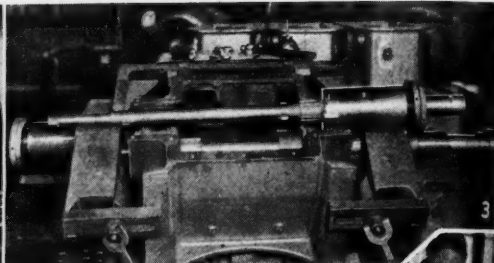
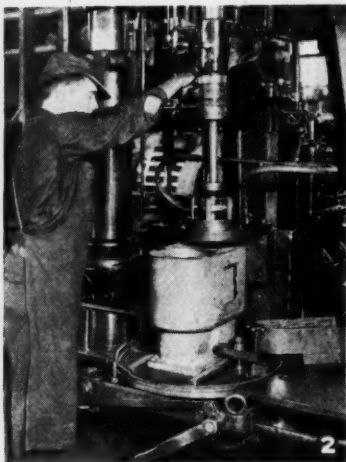


Fig. 2—Cylinders are honed in this machine after boring. Fig. 3—Crankcase in fixture for boring and reaming, showing tools. Fig. 4—Grinding the "pins" on crankshaft.

production, have led to the development of a number of interesting operations.

Cylinder blocks are finished at both ends simultaneously, the operation being performed in the Milwaukee miller shown in Fig. 1. The table of this machine passes between two vertical columns in which the cutter-spindles are located, the columns being adjustable at right angles to the table. The operator clamps three pieces to the table, then starts the cut, after which he locates and clamps three more. As soon as the first three are finished he removes them, thus saving time. Stellite cutters of 12-inch diameter are used, revolving at a speed of seventy-two feet per minute, the table feed being  $4\frac{3}{8}$  inches per minute. An extremely simple form of clamp is used, the end of one strap hooking under the end of the strap on the adjoining cylinder, and requiring the tightening

of only two nuts to clamp each cylinder.

After the cylinders have been bored, they are honed on the machine shown in Fig. 2. The block is located on the fixture by locating pins which enter the bolt holes in the flange, and is held in place by clamps. An adapter plate is used when smaller blocks are machined. The fixture revolves and, by rotating it 180 degrees, either bore is immediately aligned for honing. The hone removes from .0015 to .002 inch of stock on the diameter, finishing the bore to 6.7535-6.753, and finishes the full length of the bore, which is  $16\frac{1}{8}$  inches long. A production of seven blocks per hour is obtained on this operation.

The crankshaft and camshaft bearing holes in the crankcase are bored and reamed with horizontal boring mill. The case, which is shown in Fig. 3 located in the fixture on the boring

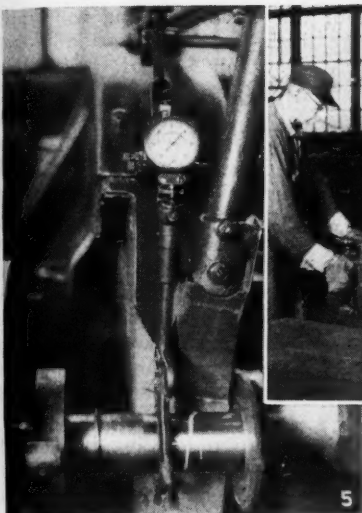
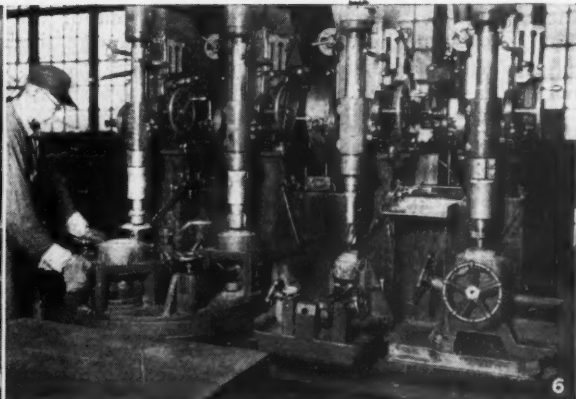


Fig. 5—Dial gauge used on the grinding machines. No time is lost in gauging work and no shafts are ground undersize. Fig. 6—Barnes four-spindle drill equipped for boring connecting rods.



mill table, is of cast iron and weighs 280 pounds, necessitating handling it with a crane. This operation calls for the boring and reaming of two crankshaft bearing holes, each 6 inches long and finishing to 3.124-3.128 diameter, and two camshaft bearing holes, each 1¼ inches long by 2.500-2.502 inches diameter. The two faces at the ends of the case, each of which is 4½ inches diameter, are also faced in this operation.

The crankshaft reamer is shown in position for operation and the camshaft reamer is shown lying on the top of the fixture. An interesting feature of this tooling is the method by which the camshaft bearing holes are reamed and the outer ends of the bearings are faced by the use of one bar. The reamer and facing tool for the right end of the case are shown on the bar; the corresponding tools for the left end are shown projecting from the bushing in which they operate in the fixture. The end of the bar serves as a shank and is grooved on opposite sides, the rear end of each

groove being notched so that as the bar enters the hole in the reamer, driving pins which protrude into the hole engage the grooves and thus form a bayonet lock when the reamer is in place on the bar. By feeding the bar back toward the machine, the reamer is pulled through the hole and the facing tool is brought up against the outer face of the bearing. Adjustable stop collars on the reamer provide for accurate measurements. To save time on this operation, the clamps are made to slide back out of the way, and wrenches are hinged-pinned to the nuts so that they will always be ready for use.

Crankshaft "throws," or connecting rod pins, are ground on the machine shown in Fig. 4. The shaft shown is for a two-cylinder motor and the pins are finished to 3.499-3.500 diameter by 3.270-3.280 inches long. From .025 to .035 inch of stock is removed in the roughing operation and approximately .010 inch in the finishing operation, the production being seven per hour on each operation. The wheel is 36

inches diameter by approximately .040 inch wider than the width of the bearing, which allows for dressing the wheel to exact width and also for dressing the corners so as to produce a  $\frac{1}{4}$ -inch radius at each end of the bearing. The wheel speed is 5,500 feet per minute.

The crankshaft journals are ground on a Norton cylindrical grinder, equipped with a gauge, as shown in Fig. 5. The end of the gauge plunger rests on the work while the machine is in operation, thus giving the operator a constant visible check on the diameter of the piece in process. The gauge is attached to the machine by a hinge, so that it can be swung up out of the way when necessary to change pieces. The operator saves time that would otherwise be lost in stopping the machine to gauge the piece, and practically eliminates spoilage of work due to grinding under-size.

Connecting rods are machined on the four-spindle Barnes gang drill, illustrated in Fig. 6. These rods weigh  $21\frac{1}{2}$  pounds each in the rough forging, and finish to  $16\frac{1}{2}$  inches, center to center. The material is S. A. E. 1035 steel, and is heat treated to obtain a tensile strength of 90,000 pounds, elastic limit of 58,000 pounds, and hardness of 179 to 228 by the Brinell method of testing. The possibility of springing the rod in clamping is precluded by the use of locating points and clamping screws which are applied directly over them. Research has disclosed that not only can a rod be easily sprung by incorrect clamping, but a rod thus machined and corrected by straightening will resume its original shape under the stress and heat of operation and will thus throw the bores out of parallel again.

The large end of the rod is rough bored with the spindle at the right

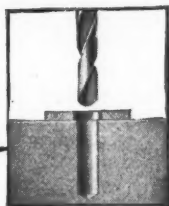
end of the machine, using a  $\frac{3}{4}$ -inch square high-speed steel double-end cutter. The top face of the tool is ground to a  $\frac{3}{4}$ -inch radius, to break up the chips, and chip room is also provided for by notching the bar in front of the cutting tool. The small end of the rod is machined under the second spindle, a three-lip drill being used to drill the  $1\frac{1}{2}$ -inch rough hole out to 2 inches diameter. The drill is followed by a boring bar carrying a double-end cutter, which enlarges the hole  $\frac{1}{8}$  inch, then a bar carrying two cutters with micrometer adjustment is used. All three cuts are taken at 72 r. p. m. and with .022 inch feed.

A three-station rotating jig is used under the third and fourth spindles for the second roughing and semi-finish boring of the large hole. The operator is shown changing rods at the third station, which is usually done while all spindles are in operation, but in the case shown the tools have been withdrawn so that they can be seen. The second roughing operation, which is performed with the fourth spindle, increases the diameter of the hole by .330 inch. The tool is a cutter of the same design as that used for the first roughing cut, operating at a speed of 57 feet per minute with .011 inch feed.

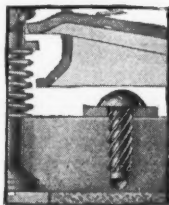
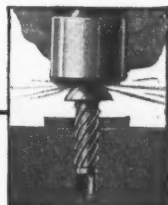
The last boring operation is performed with the third spindle, using two cutters with micrometer adjustment. The front side of each of these cutters is provided with top rake by grinding a  $\frac{1}{4}$ -inch radius in the cutter parallel with the axis of the bar, the groove running out at the lower edge of the cutter and thus producing a lip angle that will roll the chip nicely and leave a smooth hole. A cutting speed of 57 feet per minute with .011 inch feed is used. One operator turns out ten rods per hour on this machine.

The illustration Fig. 7 shows a later type of Barnes connecting rod ma-

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chine, with a rod set up on the table so that it can be seen. The machine consists of two drilling units set up on a special base, each spindle being individually motor driven. The tools are piloted so that both holes can be finished in one operation. The head on the left column is bolted in position, while that on the right column is

a production of from thirty to forty pieces per hour is maintained.

The illustration Fig. 9 shows the operation of roughing out a spline shaft, for which a hobbing machine is used. The shaft is S. A. E. 1035 steel, testing 197-170 for hardness. The splines are  $10\frac{1}{8}$  inches long by .744-.747 inch wide, and the shaft is finish-turned to

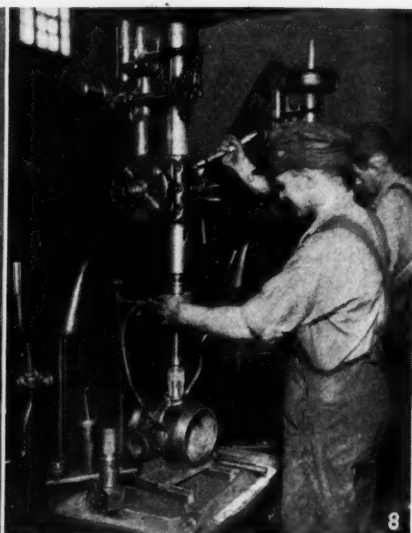
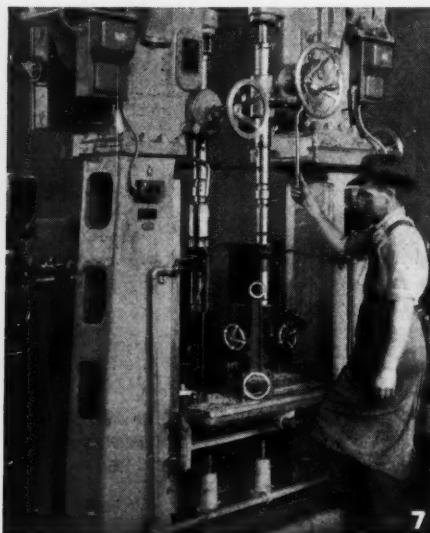


Fig. 7—A later type of Barnes drill which finishes a tractor rod complete in  $4\frac{1}{2}$  minutes.  
Fig. 8—Honing wrist pin bushings to size with a Barnes honing machine.

arranged with horizontal adjustment, making it possible to vary the center distances of the spindles to suit the work. A rod is finish-bored in four and a half minutes with this machine.

Wrist pin holes in pistons are fitted with bronze bushings which are honed to size in the Barnes drilling machine shown in Fig. 8. The hone carries six stones, which are held in place by bands consisting of closely-wound springs at top and bottom. The hone removes from .001 to .003 inch of stock and finishes the hole to .21695-.2170. A perfect job is obtained and

$2\frac{3}{8}$  inches diameter. On the roughing operation the hob runs at a speed of 60 r. p. m., with a .125-inch feed. The cutting time is ten minutes. The finishing hob runs at a speed of 110 r. p. m., and feeds .060 inch per revolution, removing .025 inch of stock on the diameter and .040 inch on the spline. The finishing time is also ten minutes.

One of the small high-speed jobs is shown in Fig. 10, where a Milwaukee vertical miller with a rotary attachment is shown in process of milling flats on connecting rod bolt heads. The fixture is made so that it revolves



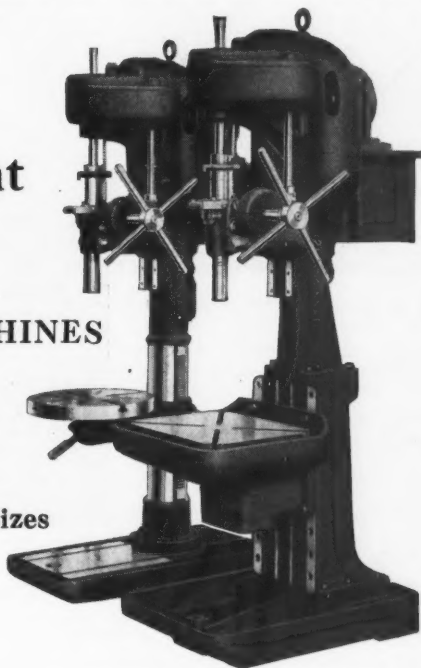
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*May we send descriptive literature?*

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OAKWOOD, CINCINNATI, OHIO

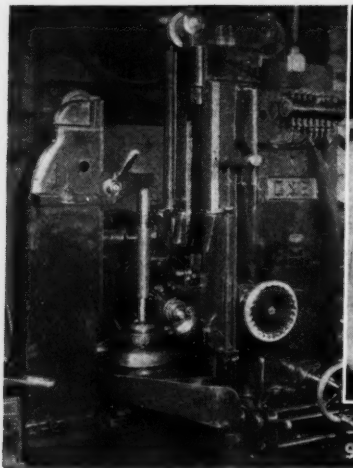
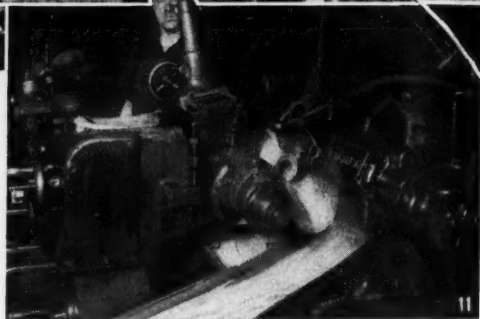


Fig. 9—A spline shaft in process of hobbing. Fig. 10—Milling flats on connecting rod bolts, using a Milwaukee vertical miller with a rotary fixture. Fig. 11—Piston pins, steel bushings, and other small cylindrical parts are ground in the centerless grinding machine.

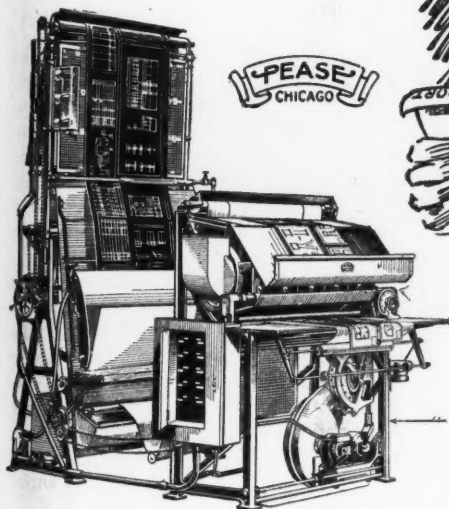


about the cutter, which is  $4\frac{3}{4}$  inches diameter and runs at a speed of 84 r. p. m. The operation is continuous, the operator's time being required to change pieces as the fixture revolves. On  $\frac{7}{8}$ -inch bolts of hard steel the production is 100 per hour. On ordinary  $\frac{5}{8}$ -inch machine bolts, such as those shown in the photograph, the production is 150 per hour.

A large part of the smaller work, such as piston pins, bolts, bushings, rods, and similar work, is ground on the Cincinnati centerless grinding machine, shown in Fig. 11. The piece shown just emerging from between the wheels is a steel bushing that is  $3\frac{1}{2}$  inches long and finishes to 3.495-3.496 inches diameter. Each piece is passed through the machine three

times, from .004 inch to .005 inch being removed in each of the first two cuts and from .0015 to .002 inch being removed in the finishing cut. A production of 600 per hour on each operation is maintained, or 200 finished pieces per hour. This machine finishes steel pins that are  $\frac{1}{2}$ -inch diameter by  $1\frac{1}{8}$  inches long at a rate of 3,000 per hour, keeping within a limit of .001 inch. Piston pins,  $1.497 \times 5\frac{1}{8}$  inches long, are finished at a rate of ninety per hour, approximately .013 inch of stock being removed. The diameter is held to a limit of .00025 inch.

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## BLUE PRINTING MACHINERY

## Progressive Assembly in the Crosley Radio Plant

By ARON M. MATHIEU

**T**HE factory of the Crosley Radio Corporation, at Cincinnati, Ohio, is chiefly an assembly plant in which the product starts on the sixth floor as a few small sections of steel and ends at the first floor as a finished receiving set—packed, sealed, and ready for the market. The keynote of the method by which production is controlled is the conveyor system, which both paces and directs the flow of material through the plant. Two kinds of conveyors are used, one kind consisting of an endless belt, as shown in Fig. 1, the other being a chain conveyor which makes a complete circuit of the factory, covering approximately one-half mile in its travels and requiring practically an hour to complete the circuit.

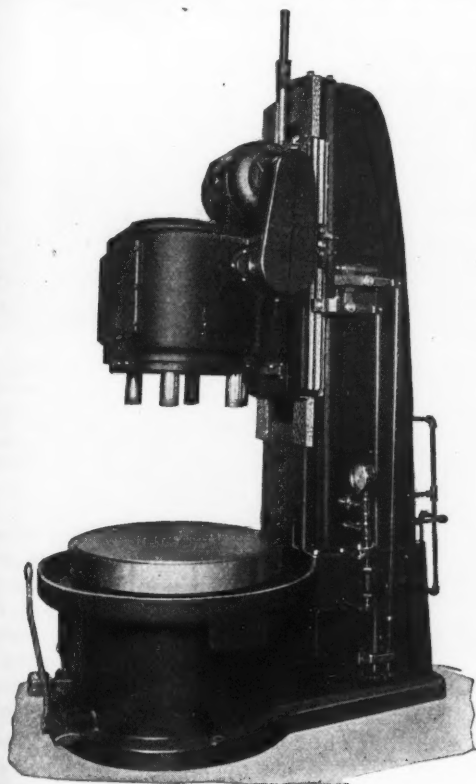
The chain conveyor consists of a trolley which runs on a track of a 4 x 2½-inch I-beam, the trolley carry-

ing a 9-inch link chain with hooks suspended at intervals of three feet. Power for the operation of the conveyor is supplied by a 7½-h. p. motor, operating at 220 volts, 60 cycles. This motor is geared to a Reeves reduction drive, which in turn is geared to a worm drive that cuts the speed to 18 r. p. m., the worm wheel shaft carrying a bevel gear which further reduces the speed to slightly less than 4 r. p. m. Two idlers are provided to take up any slack in the chain. In order to provide for the safety of both employees and material, six switches are provided—one on each floor—each one of which can be used to throw off the power and thus stop the entire system immediately.

The starting point of operation is on the sixth floor. Here the condenser plates are assembled into sets, each set of plates then being placed in

Fig. 1—Inspecting condenser units. A similar table and belt conveyor are used for assembling. Fig. 2—An overhead chain conveyor brings the condensers to the assembly department, where they are put into the sets.





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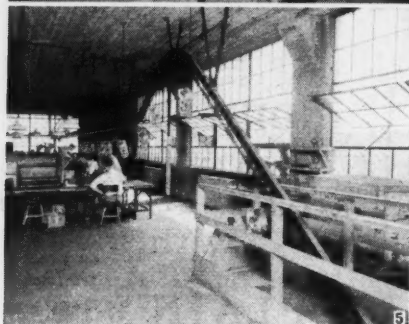
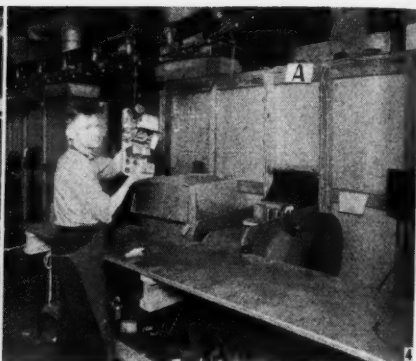


Fig. 3—Crosley "Bandbox" sets being conveyed from the assembly floor to the test-booths. Fig. 4—Hanging a tested set on the conveyor to be taken to the cabinet assembly floor. Fig. 5—The "back-track" of the conveyor is utilized to carry rejected sets back to the assembly department.

a machine where a hub is die-cast around it. The sets of plates are then assembled into units by operators sitting at a table similar to that shown in Fig. 1, after which the units are placed on a belt to be carried along to the balancers, a few feet further on. There are two of these tables and belts, each some 200 feet long. As the belt moves slowly along, the condenser is removed every few feet and another small part is added to it, the unit finally arriving at the end of the line as a finished condenser "gang."

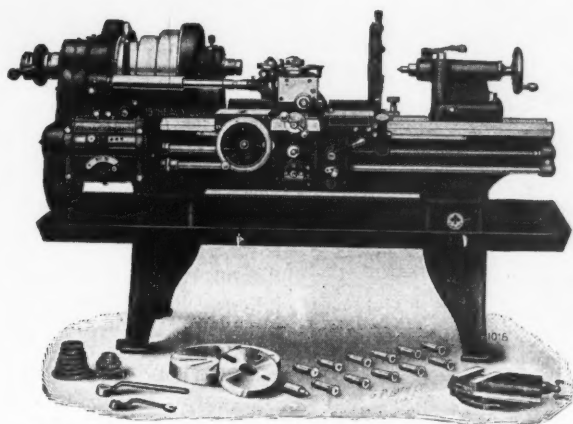
The condenser gang is now started back again on the belt shown in the illustration, which runs in the opposite direction, for inspection. It is first examined for mechanical defects, such as stripped screws, warped sides, and so on, and finally arrives at the point

where it is inspected for electrical capacity. This dual inspection is then repeated practically in full, so that by the time the gang has reached the girls who put the covers on, it is practically perfect. The finished gang is now hung on the chain conveyor, which carries it down to the fifth floor.

The conveyor crosses the fifth floor, Fig. 2, at a point where the gangs can be easily removed and placed on the benches where they are to be used. The receiving units are assembled on this floor, the unit starting at one end of the department as a bare chassis and being passed along the bench from one operator to the next as the various parts are added. The first operation consists of riveting on the tube-sockets, the coils, resistance strips, condenser gangs, and neutralizing condensers being screwed into place in the proper sequence. The unit arrives at the end of the bench practically complete except for the power unit. It is now hung on the conveyor, which has made a loop at



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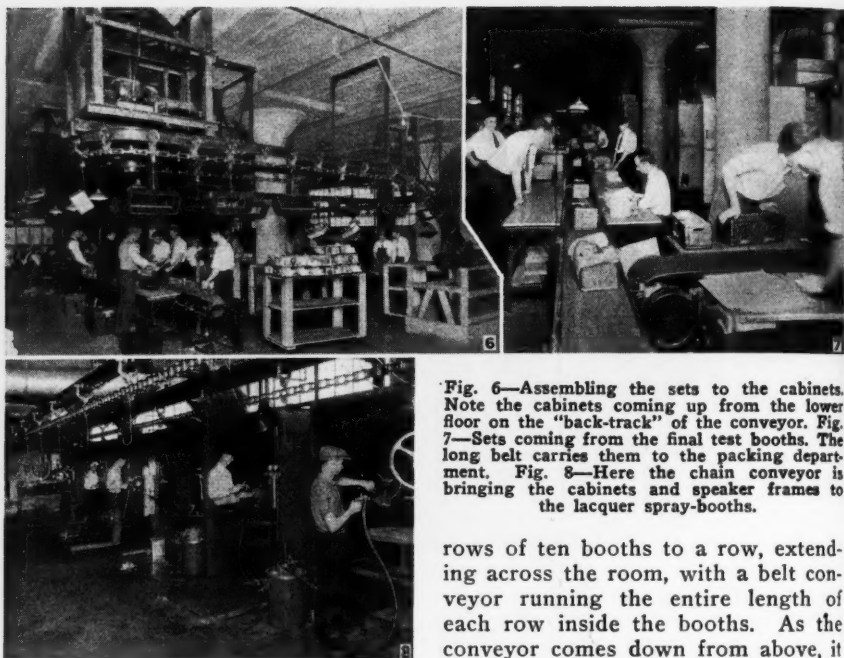


Fig. 6—Assembling the sets to the cabinets. Note the cabinets coming up from the lower floor on the "back-track" of the conveyor. Fig. 7—Sets coming from the final test booths. The long belt carries them to the packing department. Fig. 8—Here the chain conveyor is bringing the cabinets and speaker frames to the lacquer spray-booths.

the end of the room so as to come back past the ends of the benches, and is carried to the fourth floor to have the power unit added to it.

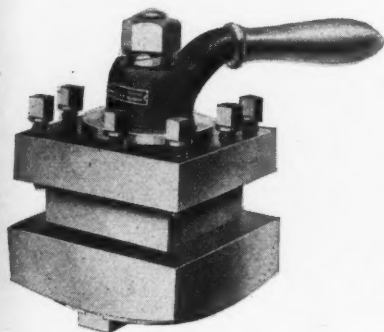
The arrangement of the conveyor is practically the same on the fourth floor as on the fifth, the receiving units being removed from the conveyor at the point where they are required, the conveyor then looping so as to come back past the ends of the benches.

The set now being mechanically complete, it is again placed on the conveyor, as shown in Fig. 3, to be transferred to the third floor for testing. Each set is individually tested in a booth that is practically sound-proof and shielded to eliminate any interference from lighting circuits, power lines, or other possible disturbers. The booths are arranged in four

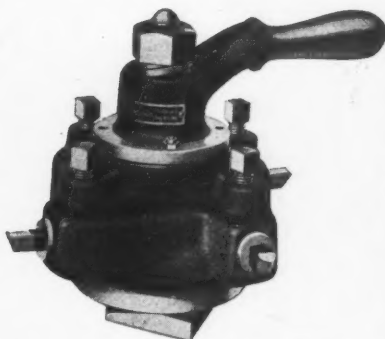
rows of ten booths to a row, extending across the room, with a belt conveyor running the entire length of each row inside the booths. As the conveyor comes down from above, it passes along one side of the room and then forms a loop, coming back on the other side. One man is detailed to remove the sets from the conveyor as they come in and distribute them to the belts which pass through the test-booths. As the sets move through the booths, they are removed and tested for balance and operating efficiency, each tested set being tagged to show that it has been tested and passed, and then they are replaced on the belts.

When the sets emerge from the booths, those marked "O. K." are hung on the returning conveyor, as shown in Fig. 4, and pass to the final assembly department. Rejected sets are hung on the "back-track" of the conveyor, Fig. 5, which carries them back to the department where they were put together. There they are dismantled and rebuilt.

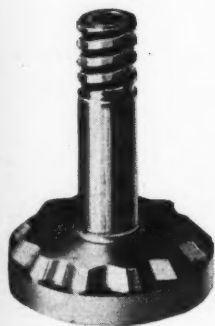
(Continued on page 44)



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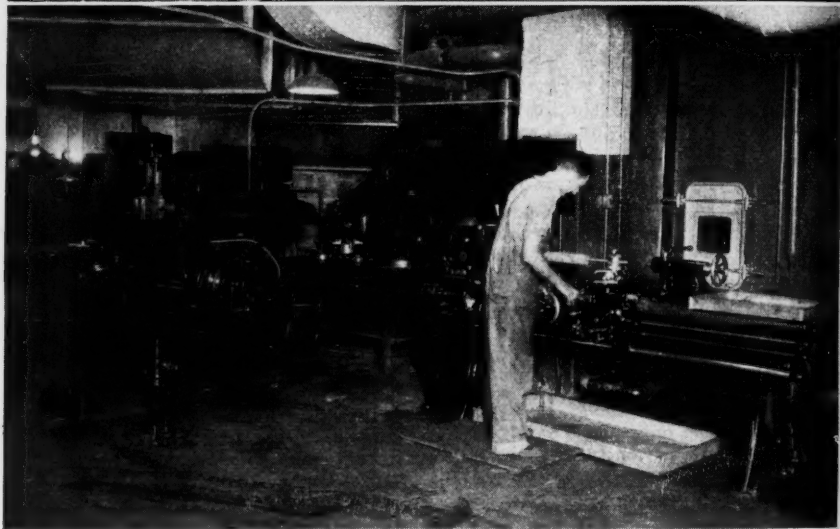
Here are two styles of McCrosky Turrets ready to be mounted on the compound rest of an engine lathe. They both take four tools. With one set-up the operator can perform four different operations in quick succession without stopping his machine. That's how McCrosky Turrets save production time, increase output, and cut operating cost.

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# McCrosky Turrets



## A Machine Shop in a Hotel

**OF** THE thousands of people who may pass in and out of a large hotel in a day, probably not one ever gives a thought to the labor and equipment that is required to keep all the machinery of such an institution running smoothly. Here are two views of the machine shop in the Palmer House, Chicago, showing a LeBlond lathe, shaper; W. F. & John Barnes drill, power hacksaw, and light drill press, all of which, the superintendent says, are used every day in the making of repairs to the elevator mechanism, air compressors, and other mechanical units.

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# A Modern Tool and Die Shop

By HOWARD CAMPBELL

**D**UE to the very nature of the work in which they are engaged, toolmakers are generally considered a slow lot of workmen. There is in Detroit, however, one organization of tool and diemakers whose speed is commensurate with their skill—and they are the best artisans available. This organization forms the production end of the Snyder Tool & Engineering

*Here is a job shop that is working on a bonus system. This article tells how and why the customers get better service, the shop gets more business, and the workmen get more money.*

is always a market for tool work of guaranteed quality and accuracy, the plant has been moved once from its original location to an especially-built building, and is now on the point of being moved again to still larger quarters. The owner, C. Snyder, believes that the best of equipment is necessary to the production of the best product, and that the best mechanics are, in the long run, very much the cheapest.

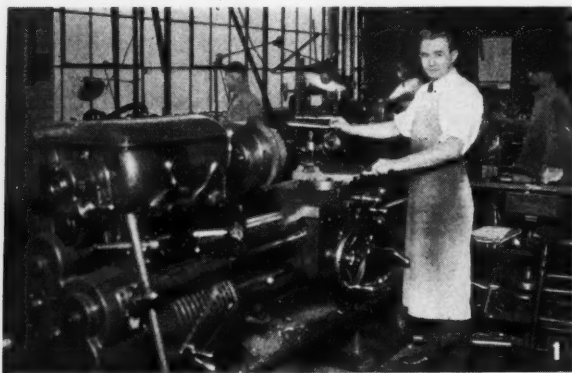


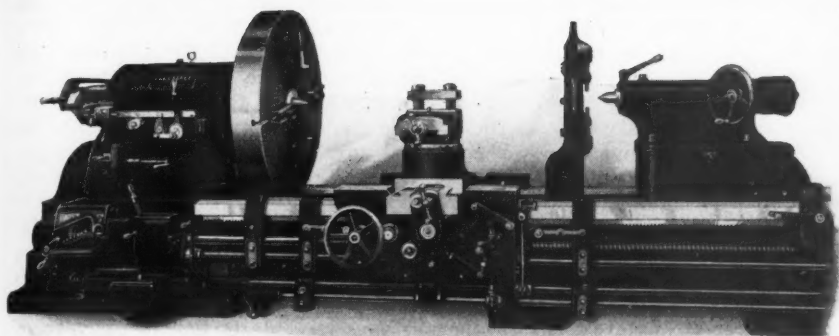
Fig. 1—The lathes are grouped together at one side of the room. Fig. 2—A battery of shapers occupies the opposite side of the room at the front.

Company, builders of jigs, fixtures, dies, special machines, and other work that calls for a high quality of workmanship.

It is a singular and in-







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*Send for complete description of our line of Lo-Drive Lathes, which, on account of patent, cannot be supplied by any other lathe builder.*

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*Precision Lathe Builders Since 1840*

All orders that are accepted are taken on contract. When a job is brought in, either by a customer or by one of Mr. Snyder's own salesmen, an idea for the design of the tool or fixture is developed and a rough sketch is made to give the customer an idea of how the tool will work and what may be expected of it. The sketch is accompanied by a form that is filled out to show the "proposed equipment" as follows: Machine; standard attachments; special attachments; special fixtures; perishable tools, and estimated production in pieces per hour. The production is guaranteed without reservations, and the price for the job is given to the customer with the estimate. If the proposal is accepted by the customer, the necessary drawings are then made, estimates are made of the time required for each operation, and the job is turned over to the shop.

As each workman starts on a new job, he receives from the shop clerk a job ticket which carries the name and number of the job, any special instructions, and the estimated time for the operation. If the workman can by any means of skill or ingenuity shorten the time required for the operation, he receives a bonus of three-fourths of the time saved at his regular hourly rate, the firm taking the other fourth. This incentive tends not only to speed up the work considerably, but its benefits have been far-reaching in many ways that were not easily apparent.

A rigid inspection is maintained, however, and any work that falls short of the required standard is done over by the workman on his own time. This fact, together with the knowledge that each man in this organization has been selected for his job because of his skill as a workman, has the effect of making the men particularly careful to avoid making mistakes. The adoption of this system has actually had the ef-

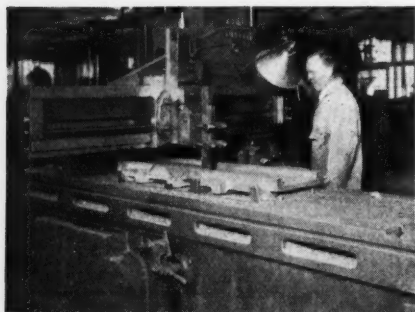
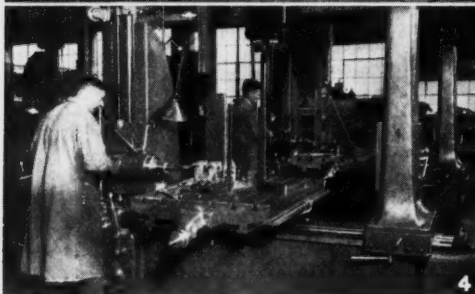
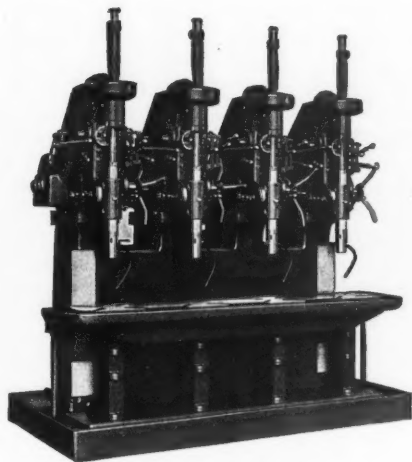


Fig. 3—Planing slides for drill presses on an open side planer. Fig. 4—Two of the four horizontal boring machines. Fig. 5—A die-filing machine in operation.





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Self-Oiling All-Geared machines are unexcelled for general all-round drilling, tapping, boring, reaming and kindred operations, including cylinder honing.

When work in process requires multiple operations in medium or large quantities, these machines can be built in gangs having almost any desired number of spindles in various combinations for hand control or having an automatic cycle. The scope of the machines is further enlarged by the use of numerous attachments developed through our close cooperation with manufacturers everywhere. Our catalog illustrates and describes these products in detail.

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fect of making the men more careful, has increased production considerably without increasing overhead expense and without increasing the amount of equipment necessary, has practically eliminated wide variations in costs, and has increased wages substantially without increasing production costs.

Each die job is given to a diemaker, who is responsible for the entire production of the job. Any machine work that is required is given by him to one of the machine operators, with whom he splits the bonus according to the amount of machine time put in. He has the option of selecting the operator to whom the job is to be given, providing the operator selected has not too many jobs ahead and

providing other operators are not idle. This method of handling the work divides the responsibility and reduces the amount of supervision required.

The shop is of one-story, modern "daylight" construction. Four rows of benches and four corresponding rows of surface plates extend longitudinally through the center of the shop, with the machines arranged on either side. The lathes are grouped at one side near the front end of the shop, the shapers being grouped on the other side in a corresponding position. Views of these departments are shown in Figs. 1 and 2. Fig. 3 shows an open-side planer in use for planing slides for drill presses, these parts forming part of an order which

is being machined for a large machine tool manufacturer.

Two of the four horizontal boring machines are shown in Fig. 4, one being

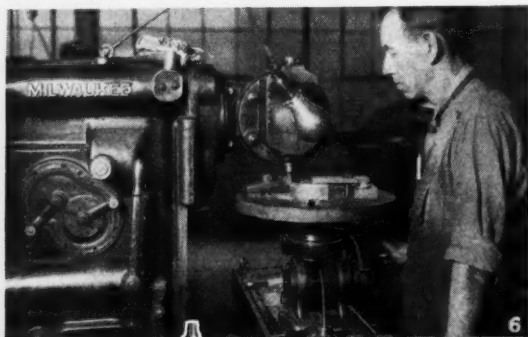
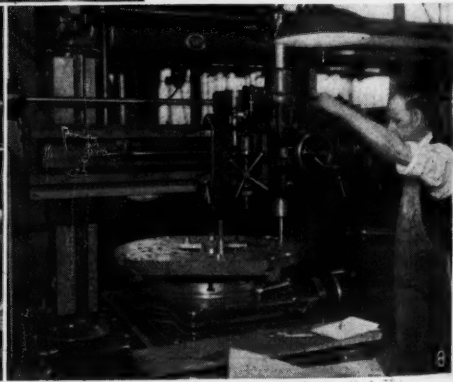
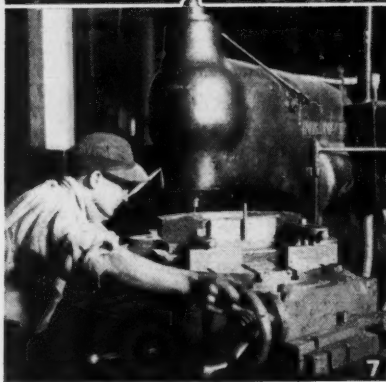


Fig. 6—Profiling a die section on a Milwaukee milling machine with a vertical milling attachment. Fig. 7—Using a Milwaukee vertical mill to mill an elliptical groove in the surface of a die. Fig. 8—Boring bushing holes in a bushing plate for a jig. There are 83 holes in this plate to be bored.



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This customer also states, "We claim for this lathe 25% more production than we can get on a plain bearing machine."

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18" CISCO Ball Bearing Spindle Lathe

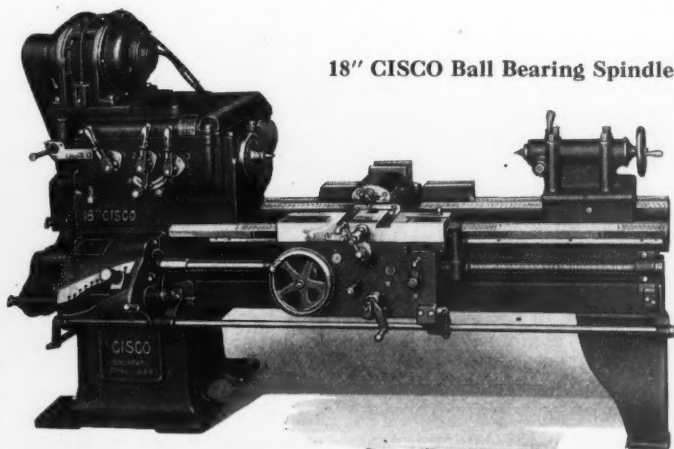
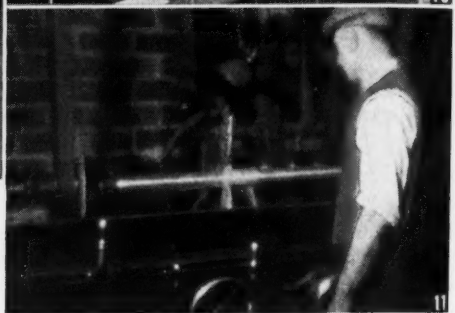
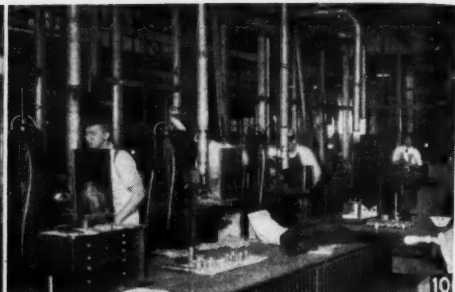




Fig. 9—The King boring mill is used for boring the large holes. The piece shown in process is a pulley for an experimental machine. Fig. 10—A line of surface grinders. Note the glass partition which separates the grinders from the rest of the shop. Fig. 11—Grinding a boring bar for use in an automobile manufacturing plant.



shown in process of boring a series of bearings in a special machine part, the other boring holes in a fixture. The mechanic shown in Fig. 5 is using a die-filing machine to put the finishing touches on a die. The mechanic shown in Fig. 6 is profiling a die section, for which he is using a Milwaukee milling machine with a vertical attachment. The work is clamped to a surface plate which is being revolved by means of an index head. The Milwaukee vertical milling machine, shown in Fig. 7, is being used to mill an elliptical groove in the surface of a die. This die is composed of eight separate sections, with eight different radii, requiring eight separate adjustments of the machine. The object of designing the die in this manner was to make possible the replacement of any section which might become dam-

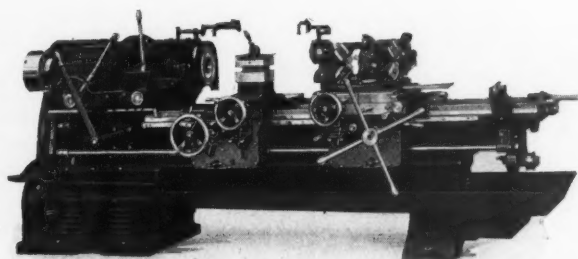
aged without necessitating the construction of a complete new die.

In one corner of the room, segregated from the surrounding machinery by an iron railing, stands the jig-boring machine shown in Fig. 8. The operator is shown in process of boring eighty-three holes in a bushing plate for the jig. This machine is accurate to a remarkable degree, the table and head feed screws being found by test to be accurate within .00025 inch in 22 inches. The use of buttons for locating is entirely eliminated by the use of this tool, and production time is reduced to the minimum.

A King boring mill is shown in Fig. 9, in use for boring the shaft hole in a pulley for an experimental machine. This machine was also selected because of its ability, accuracy and sensitiveness on fine work.

The grinding department, which is equipped with several Norton cylin-





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Fig 12—All flat bearing surfaces are scrapped with this Anderson power scraper. This machine saves 50 per cent of the time required for hand scraping. Fig. 13—One corner of the inspection department. Every tool that passes these inspectors is guaranteed for quality, accuracy, and production.

drical grinders, two internal grinders, and a battery of surface grinders, is separated from the rest of the shop by a glass partition, as shown in Fig. 10. Although the grinders are all equipped with pipes through which most of the dust is drawn by the blower, the partition keeps the dust from getting into the bearings of the other machines in the shop. This illustration shows the line of surface grinders at one side of the room.

The mechanic shown in Fig. 11 is grinding a boring bar which is one of a lot that is being made up for a large automobile manufacturing plant.

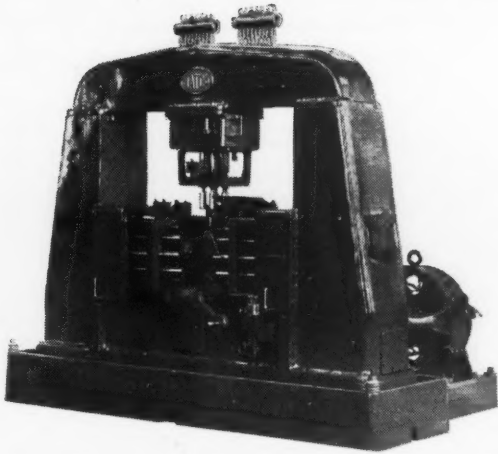
The time of scraping flat bearing surfaces has been cut in half over the "hand" method by the use of the Anderson power scraper, shown in operation in Fig. 12. The mechanic is shown scraping the surface of a plate which is part of the same fixture for which the plate is being bored on the jig-boring machining. By cutting down production time and reducing a laborious operation to a comparatively easy one, this tool makes possible bet-

ter deliveries, better work, and lower costs.

The shop also maintains a heat treating department, consisting of two gas furnaces for carbonizing, hardening and normalizing, a cyanide bath, a tank each of hot oil and quenching oil, and a tank of water for water-hardening.

A view of one corner of the inspection room is shown in Fig. 13, where two finished tools may be seen in process of final inspection. Practically every tool used for tool inspection purposes will be found in this department, including several sets of micrometers, three height gauges, two sets of Johansson blocks, one set of Johansson gauges ranging in steps of .005 inch from  $\frac{1}{4}$  inch to 3 inches, Rockwell tester, sine bars, fluid gauges for close measurements, and so on. Every jig or fixture that passes these inspectors is guaranteed for quality, accuracy, and production.

Mention **MODERN MACHINE SHOP** when writing advertisers.



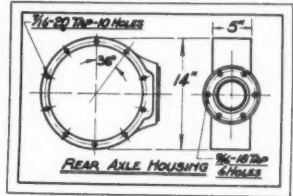
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The machine shown above is a Natco 3-Way Lead Screw Tapper built up of one vertical and two horizontal heads with individual lead screws to each individual tap.

The machine is operated by a 25 H.P. Constant Speed Motor, which drives the main reversing box, which, in turn,

drives each of the heads. The operator completely controls the machine by one air valve. This machine taps 26 holes in the two sides and front of a rear axle housing for a well known automobile.

The number and size of the taps is shown in the line drawing.



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| Standard Adj. Multiple   | Hi-Duty Single Spindle |
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**THE NATIONAL AUTOMATIC TOOL CO.**  
**RICHMOND, INDIANA, U. S. A.**

# The Nature and Properties of Iron and Steel

By GEORGE M. ENOS

Assistant Professor of Metallurgy, University of Cincinnati

**A** HALF a century ago the only men who knew what the presence of carbon, silicon, manganese, phosphorus and sulphur in iron and steel signified, were the chemists or metallurgists who analyzed the metal, and even their knowledge was incomplete. The steel manufacturers came to definite specifications only when the purchasers demanded it. One of Charlie Schwab's pet stories concerns the old iron-master under whom he worked in his earlier days, and who, when given an order for steel of certain specifications, said: "Charlie, this blanked chemistry is going to ruin the steel business."

Contrary to his statement, however, chemistry and metallurgy have changed steel-making from guesswork to a science, and have made possible not only the production of metals and alloys having certain definite qualities, but also the exact duplication of those metals in any quality at any time.

## Production of Pig Iron

Reduction of iron ore in the blast furnace is the first of a series of metallurgical processes which result in the production of fabricated iron and steel parts. From the pig iron as a raw material, wrought iron, various kinds of cast iron, and steels are produced. A modern iron blast furnace represents an investment of several millions of dollars. Depending on the size, a blast furnace produces from

*An understanding of the physical properties of iron and steel is necessary to the machine shop executive of today. This article is the first of a series dealing with this important and interesting subject.*

400 to 1,200 tons of pig iron a day, and is usually in continuous operation for many months, or until repairs are needed which cause a complete shut-down.

A diagrammatic view of a section through a typical blast furnace is shown in Fig. 1, and in Fig. 2 the flow of materials through the plant is

indicated. The principal iron ore is hematite, an earthy material which contains about 50 per cent to 60 per cent iron in the form of iron oxide (a chemical compound of iron and oxygen) and which, in the United States, is mined extensively in the Lake Superior and Birmingham districts. The ore is put into or "charged to" the furnace with certain given amounts of coke and limestone, the latter to act as a flux and thus aid in the melting of the ore.

The coke, by burning, furnishes heat which is carried by hot gases up the stack, thus preheating the materials to be melted before they actually reach the zone of combustion. Either the hot carbon or the carbon monoxide, which is one of the hot gases, robs the iron oxide of its oxygen, thus reducing the iron oxide to metallic iron, which, however, is not melted until after it has absorbed some carbon. This absorption of carbon is similar to the absorption of carbon in the case hardening process. The process lowers the melting point of the iron,



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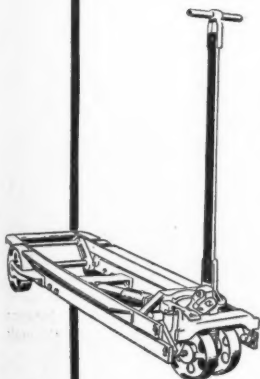
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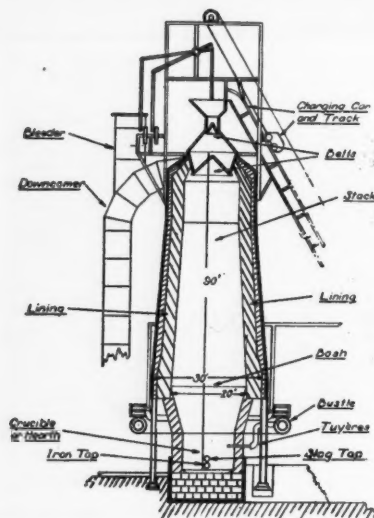


Fig. 1—Diagram showing cross-section elevation of an iron blast furnace.

so that it is readily melted in this type of furnace.

The production of one ton of pig iron requires about two tons of ore, one-half ton of flux, and one ton of coke. For each ton of pig iron produced, the furnace also produces several hundred pounds of slag, and about five tons of combustible gas. The gas is carried off to the hot blast stoves, where it is used to pre-heat the blast, and the excess gas is usually burned in the power plant. The hotter parts of the furnace are water-cooled.

The earthy materials, which were associated with the iron ore, unite with the flux to form a molten slag, which collects on top of the molten iron. Provision is made for tapping the furnace so that the iron and slag can be drawn off separately.

In obtaining the metallic iron from the ore, some of the silicon, manganese, phosphorus and sulphur which are present become alloyed with the

iron. Varying amounts of these elements are also found in the slag. Pig iron usually contains from 91 per cent to 94 per cent metallic iron, 3 to 4.5 per cent carbon, from .50 to 3.0 per cent of silicon, .25 to 2.5 per cent manganese, up to .065 per cent sulphur, and .04 to 2.0 per cent of phosphorus.

### Cast Iron

About ninety-two elements make up all substances known to man. Of these over half are metals, and the balance are non-metals. All elements may be described in terms of their physical and chemical characteristics. A certain group have the chemical characteristics of non-metals and the physical characteristics of metals. An element belonging to this latter group is called a metalloid, the list of metalloids including carbon, silicon, phosphorus and sulphur. In cast iron we have a complex alloy, made up of two metals, iron and manganese, and the

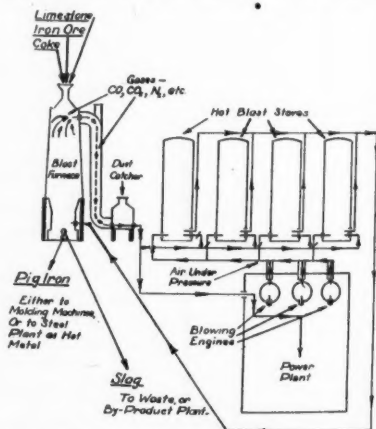


Fig. 2—Flow sheet for an iron blast furnace plant showing the course of materials through the plant.

four metalloids, carbon, silicon, phosphorus, and sulphur. Theoretically, cast iron could be considered as an alloy of iron and carbon, but such



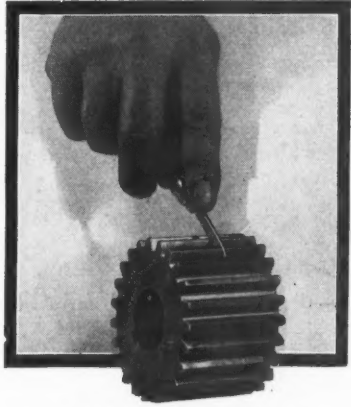
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# DOUBLE-D

All Metal  Silent Gears

cast irons are not used in industry. Carbon, however, is the most important constituent in the alloy. Silicon exerts very marked effects upon the constitution and properties of cast iron. The effects of the other elements upon properties of cast iron

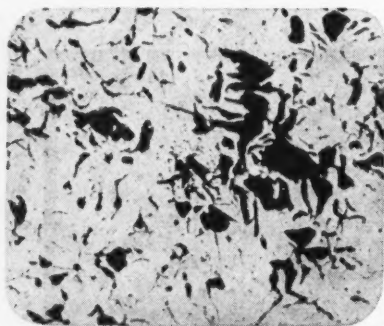


Fig. 3—Graphitic carbon in gray cast iron. Unetched. X65.

are secondary to the effects produced by variations in carbon and silicon percentages.

**CARBON:** Carbon may appear in cast iron in two forms; viz., graphitic carbon, and combined carbon. When carbon is in the combined form, three atoms of iron hold one atom of carbon in combination, forming the iron carbide ( $\text{Fe}_3\text{C}$ ), which is more or less unstable and subject to decomposition upon heating. If a great deal of the carbon is in the graphitic form, the alloy resembles a steel which is porous and where the voids are filled with graphite. Such iron is usually soft and gray. If all the carbon is in the combined form, the cast iron resembles a very high carbon steel in structure and properties, and is called "white iron." White iron is very hard. The structure and constitution of the cast irons also are affected by the percentage of silicon and the rate at which the iron is cooled from the molten form.

**SILICON:** When the iron contains less than 3 per cent of silicon, and the casting is cooled slowly, the silicon acts as a softener; that is, it promotes the formation of graphitic carbon. With more than 3 per cent of silicon, the iron becomes increasingly hard and brittle.

**MANGANESE:** The principal effect of manganese in cast iron is to overcome the evil effects of sulphur. This it does by forming a chemical compound, manganese sulfide, whose physical form and occurrence in the iron is such that the embrittling effect of sulphur is minimized. There should be at two and one-half times as much manganese as sulphur present.

**SULPHUR:** Sulphur renders the iron alloys "red hot" (brittle when red hot), unless this effect is overcome by the addition of manganese. The sulphur should not exceed 0.10 per cent.

**PHOSPHORUS:** This element has a very marked effect in increasing the

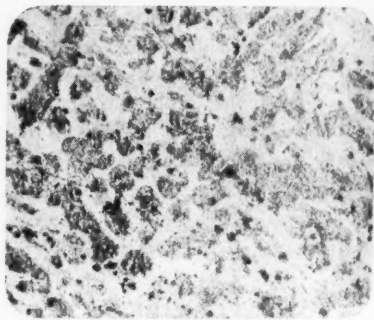
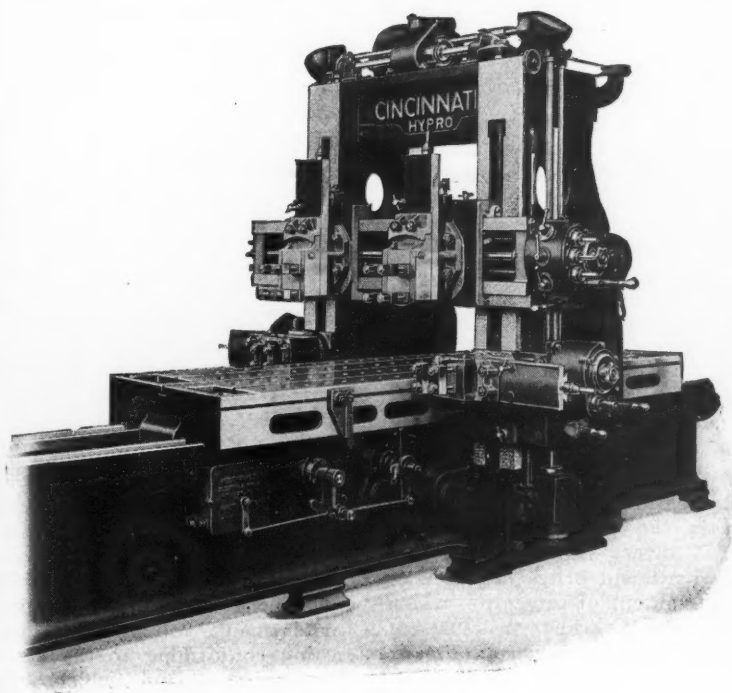


Fig. 4—Cementite, white areas, and pearlite, gray areas, in white cast iron. Unetched. X100.

fluidity of the iron in the molten condition. For this reason foundrymen frequently use high-phosphorus pig iron in producing castings which have thin sections. The general effect of phosphorus is to render the material "cold short"; that is, the strength of

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the cast iron is lowered by the addition of phosphorus.

Cast irons always contain over 1.7 per cent carbon, and usually above 2.25 per cent. There are several kinds of cast iron, which may be briefly described as follows:

Gray Cast Iron is characterized by the presence of flakes of graphite, which aid in machining the metal. The material surrounding the graphite flakes is essentially a steel, and hence will be made up of the same structural constituents as occur in annealed steels; i. e., ferrite, cementite, and pearlite. Ferrite is pure iron. Cementite is an iron carbide—a chemical compound of iron and carbon ( $\text{Fe}_3\text{C}$ )—which contains 6.67 per cent carbon. Pearlite is a mechanical mixture of ferrite and cementite in such proportions that the carbon in the pearlite is about 0.85 per cent. A photograph of the structure of gray cast iron as seen under the microscope is shown in Fig. 3, in which the graphite flakes can easily be seen.

White Cast Iron contains all the carbon in the combined form. Its fracture is silvery white and the material is hard and brittle, because of the large amount of cementite, which itself is brittle. The structure of white cast iron is shown in Fig. 4. White cast iron must be low in phosphorus and sulphur, and must conform to specifications for the other elements. The principal use of white iron castings is in the production of malleable castings.

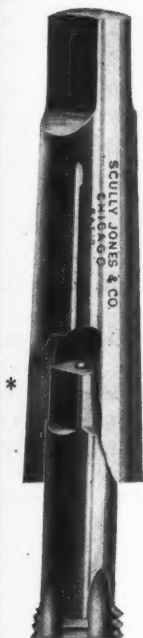
Malleable Cast Iron is made by annealing white iron castings under carefully controlled conditions, at a temperature of from 1,500 to 1,850 degrees for several days and then allowing them to cool slowly. This treatment releases much of the carbon from the combined form to the graphitic form, and the casting is then

malleable. The carbon is known as "temper" carbon and can be distinguished under the microscope from the graphitic carbon of gray cast iron by its occurrence as small rounded masses rather than flakes. There are two kinds of malleable cast iron, the "white heart," where much of the carbon is actually burned out during the annealing, and the more common "black heart," from which only the carbon in the outer skin has been burned out.

**SEMI-STEEL:** When steel scrap is used as a part of the charge in producing gray cast iron, the physical properties are benefitted, especially the tensile strength. Up to 50 per cent steel scrap is the amount usually charged. High strength cast irons are of comparatively recent development. The gray cast iron is improved by the addition of nickel or chromium, or by treatment of some special process.

### Foundry Practice

It is beyond the scope of this article to describe methods of making castings. There is need for closer co-operation between designer, foundryman and machine shop superintendent in producing good castings. The foundryman's job is to produce a casting conforming to the design of the engineer, and which can be handled by the machine shop. In brief, in the gray iron foundry, for example, the pig iron and scrap are melted in a cupola, using coke as the fuel. The molten iron is poured into sand molds, which have been produced through the co-operative efforts of the pattern maker, core maker and molder, and there solidifies. Many variables in operation are encountered, which may result in poor castings. Defective castings may be classified into two groups, those rejected by the foundryman on inspection and the



\*Section removed to show position of tap in chuck.

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other group where the defects are not revealed until the casting is machined. With the first group the machine shop is not concerned if foundry inspection has been rigid. Most of the defects

Consideration of the above classification indicates that very seldom can a really defective casting be saved from the scrap heap.

The causes of the defects have not been discussed; some are traceable to

### Classification of Defects in Gray Iron Castings

#### DEFECT

#### DISCUSSION

1. Actual cavities .....If not too large may be filled up by welding in metal, if this is permissible.
2. Protruberences .....If the dimensions are not too much out, the excess metal may be chipped or ground off.
3. Misplaced sections ...If the distortion is too great, the casting is scrapped.
4. Potential cavities (dirt, slag, chill-balls) ....If surface appearance must be considered, it may be necessary to scrap the casting. Such defects do not usually affect strength, but might be serious in pressure castings.
5. Warping or bending..Unless the casting can be machined to desired dimensions, it is scrapped.
6. Actual cracks .....No remedy except possibly welding.
7. Potential cracks or zones of weakness...Difficult to detect.
8. Internal defects, usually segregations .....The casting is scrapped if the defects are serious. These defects may not be revealed until the casting is machined.

revealed by a machining operation may be traced to segregations, which are usually hard and brittle, and often are porous. The defective region may contain "dirt" or slag.

improper design, based on an inadequate knowledge of the properties of cast iron on the part of the designer, while some are traceable to poor foundry practice.

### Assembly in Crosley Plant

(Continued from page 22)

A view of the final assembly department is shown in Fig. 6, showing the return or "back-track" of the conveyor bringing finished cabinets from the second floor to meet the finished sets coming from the test-booths. When each set is complete it is given a final test in another test-booth and is then placed on the belt shown in Fig. 7, which carries it to the packing

room and shipping department.

The illustration Fig. 8 shows the spray-booths on the first floor, where the cabinets and speaker-frames are lacquered. The pieces are hung on the conveyor in the receiving department and are removed, as required, by the finishers.

This is an excellent example of the manner in which a single conveyor can be utilized to move material through all the departments of a plant.



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**SENSITIVE  
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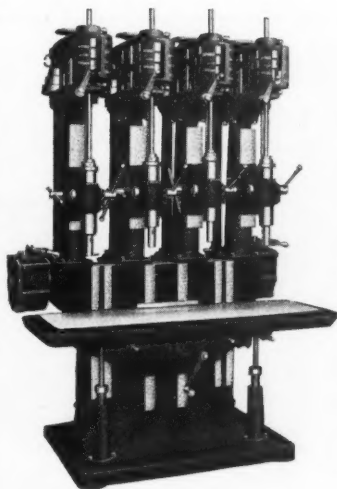
Ball Bearings on all revolving parts.

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Patented Belt Shifting Mechanism, using a central cam drum, controlled by crank.

Four-cone pulley gives four speeds. Range of three sets of speeds to choose from.

Channel for chips and lubricant around table.



Spindle of Chrome Nickel Steel, accurately ground.

Spindle Sleeve is supplied with one thrust and two radial ball bearings.

Head is adjustable and can be clamped in position.

Power Feed. Four geared feeds for each spindle. Feed-engaging clutch and all gears are enclosed.

Patented Tapping Attachment is clamped to quill or sleeve and is driven.

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## Grinding Lathe and Planer Tools

Lathe and planer tools should be ground in tool-grinding machines, as this method of grinding is safer and more satisfactory unless the operator has exceptional skill. Machine grinding saves the workmen time, saves the time of the lathes and planers that would otherwise stand idle while the tools were being ground, insures correct grinding angles, increases the life of the tool, increases production, raises the quality of the work and permits of a smaller investment in expensive high speed steels.

When grinding wet, a copious stream of water should flow at low

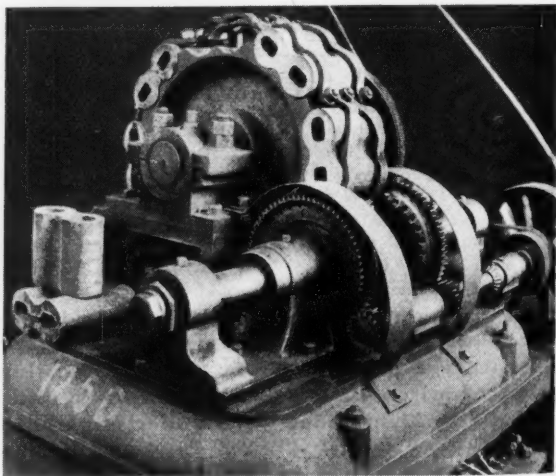
velocity directly upon the nose of the tool. It should be ample to take up the heat as fast as it is generated; five gallons a minute is good practice. A little water is far worse than no water at all, as it is the direct cause, many times, of surface cracks and checking. When grinding wet, the grinding should not be done too forcibly as the water is thus temporarily kept from the surface being ground, and when the tool is released, the cool water strikes the hot surface and causes it to crack.

(From "Tool Room Grinding," pub. by Norton Company.)

## The First Continuous Milling Machine

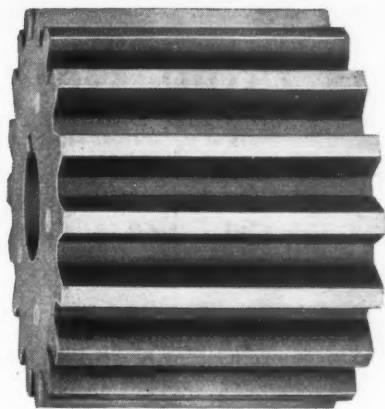
The illustration shows what is believed to have been the first continuous milling machine ever built. The machine was built in 1893, in the plant of the P. H. & F. M. Roots Co., Connersville, Indiana, where it was in use for many years before being discarded for more modern equipment. The work-carrying wheel was made of a large cast gear blank into which recesses of suitable size and shape to hold the work were machined, the pieces being held on the wheel by clamps, as shown. Power was transmitted to the wheel through a set of spur and bevel gears and a worm and worm-wheel, the worm-wheel being located on the shaft that carried the

work-carrying wheel. The machine was used to mill the ends of impeller



The Oldest Continuous Milling Machine

castings, which are used in the manufacture of Roots blowers.



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# FORMICA

## Ideas From Readers

*This department is a clearing-house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay \$5 for each one published.*

### Grinding-in Locomotive Cylinder Heads

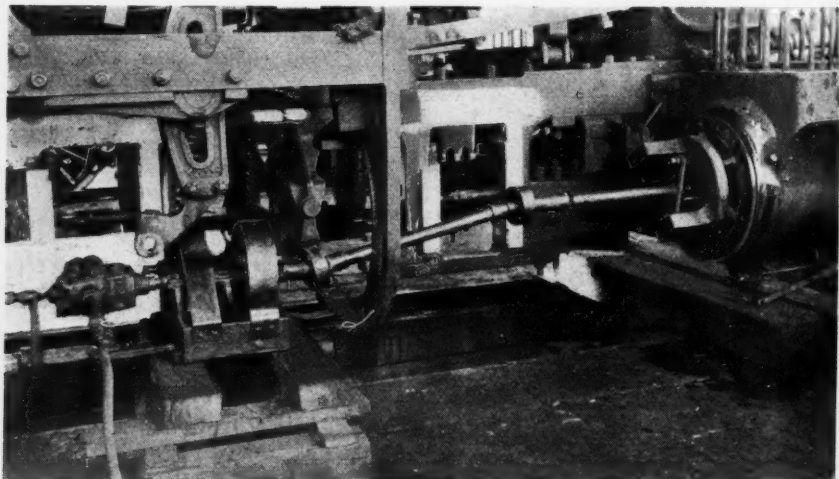
By PAUL A. BARD

IN ONE of the Southern Pacific railway shops locomotive cylinder heads are ground-in with the apparatus shown in the photograph. The outfit consists of an air motor and a set of gearing through which power from the motor is transmitted to a universal shaft which is bolted to the head. When the air is applied, the head is revolved at a speed of 3 r. p. m. A head can be ground-in to a steam-tight fit in from two to six hours, depending upon the condition of the seat when starting.

### Chip Guard For Shapers

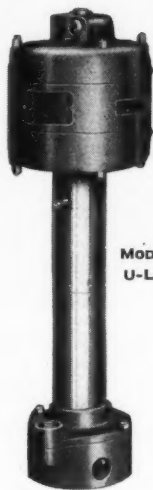
By H. L. WHEELER

A BATTERY of shapers working all day usually produces a mass of chips which invariably spread over the floor in the immediate vicinity. They also make a lot of unnecessary work for the sweepers. One shop has eliminated this nuisance by providing chip deflectors and pans as shown in the drawing. The deflector is built of  $\frac{3}{4}$ -inch boards with a wing on each side at an angle of 45 degrees. A chip pan, which is made of sheet iron, fits into the deflector and sets on a shelf just a few inches from the floor. A handle on either side of the pan provides for easy removal.



Grinding-in locomotive cylinder heads with an air-motor.

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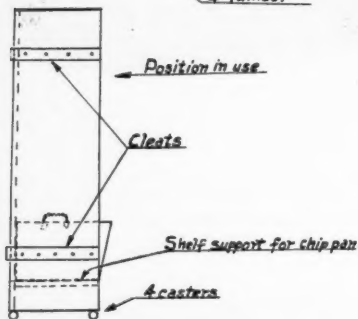
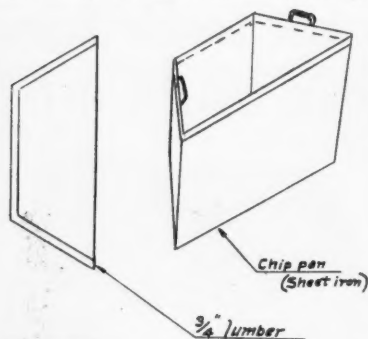
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Advise us when it will be convenient to you to have one of our men call and thoroughly investigate your grinding problems. This will not put you under any obligation and may be the means of considerably increasing your operating profits. We would be glad to send you for your files detailed information about our grinding wheels and machinery. Put that letter to us on your list of "Things to Do Today."

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The deflector is high enough so that practically all of the flying chips will be stopped and will fall into the pan. Four casters under the deflector pro-



Chip Guard for Shapers

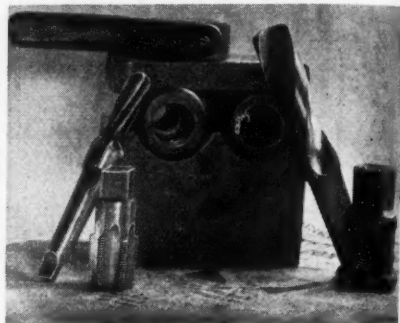
vide for moving it about as desired. These deflectors have well paid for themselves by the amount of work saved and the improved appearance of the floor in the shaper department.

## Machining Locomotive Cylinder Cock Bodies

By J. H. HAHN

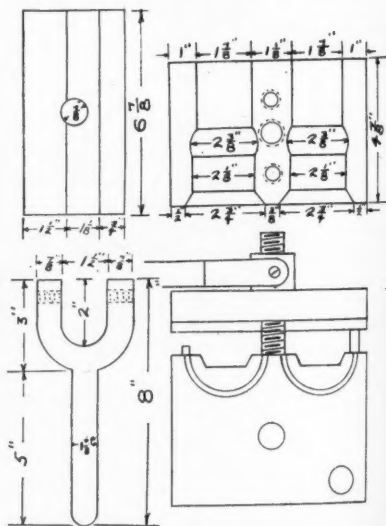
THE drawing and photograph which accompany this article show the dimensions of a locomotive cylinder cock body jig and the tools with which the body is machined. The bodies, two of which are shown in position in the jig, are each drilled for

a 1¼-inch pipe tap, a 45-degree seat is machined for the valve, the hole is finished for the valve guide, and the



Jig and tools for machining cylinder cock bodies.

large hole is tapped. The pipe tap drill is at the right in the photograph and the combination tool for reaming the valve guide hole and cutting the



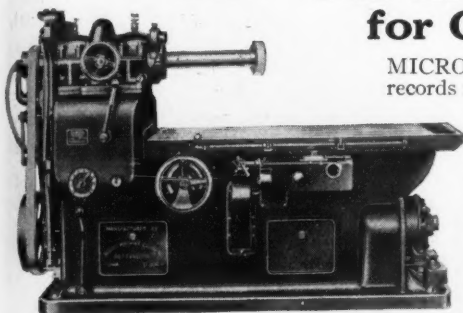
Dimensions of cylinder cock body jig.

valve seat is shown at the left. The pieces are quickly and easily clamped





## For those who Strive for Greater Accuracy



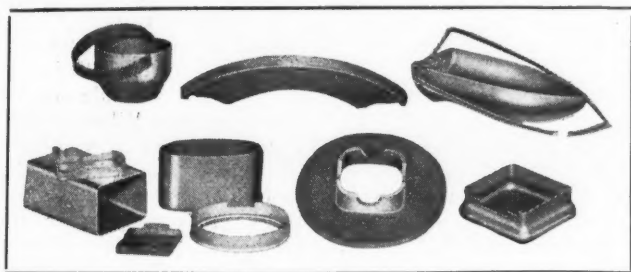
MICRO Grinders have established amazing records for accuracy in grinding all sorts of internal surfaces. Micro Grinders have an unusually wide performance range, too. For example, the Model "DG" illustrated, is capable of grinding round holes from  $1\frac{1}{8}$ -inch to 15-inch diameter, and sizing to .0005 of an inch. Micro Grinders are built for every type of duty. Easy to operate. Write us your requirements.

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**The Steel Products Engineering Co.**  
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**AVERBECK SHARPERS : CONTRACT WORK**

in position, and the jig can be made at a very small cost. The time for machining the bodies with this outfit was four minutes each.

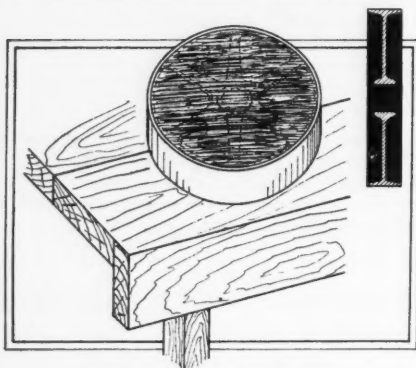
## Using a Soft Anvil

By C. T. SCHAEFER

**I**T IS occasionally necessary to handle finished parts in such manner as to invite danger of burring finished surfaces, as in the case of disassembling completed units. The danger is

same time eliminated one of the greatest causes of wear and tear on the work benches.

The hub of an old steel line shaft pulley has been turned down below the surface of the rim, on both sides, and the pulley has been filled with lead or babbitt. Babbitt is preferable, as it is lighter and makes handling more convenient. Any necessary hammering or pounding is done on this babbitt surface without danger of burring finished parts.



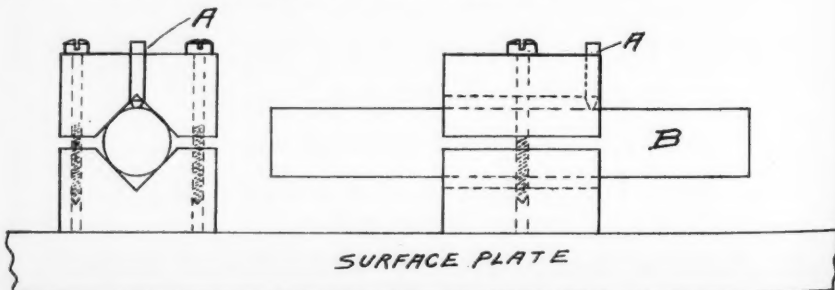
A soft anvil saves the bench.

all the more great if it is necessary to drive a piece on or off a shaft. To protect the parts, such work should be done on a soft surface. The illustration depicts the simple manner in which one enterprising shop has solved this problem and has at the

## Stamping Cylindrical Work

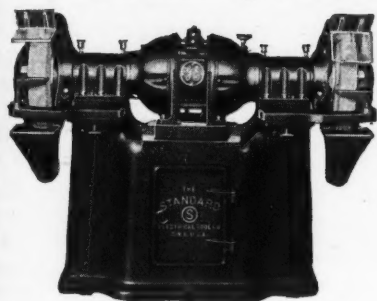
By CHARLES KUGLER

**A**S IT is practically impossible to do a neat job of stamping figures or letters on a cylindrical shaft by holding the stamp in the hand, we built a fixture, shown in the drawing, with which to perform this operation. We cut V-slots in two angle plates so that when the plates were put together, the slots formed a square hole. The angle plates were then drilled and tapped for large filister head screws, and a hole was drilled and broached to serve as a guide for the stamps, shown at A. When ready to stamp a shaft, it is put through the hole and the screws are tightened just enough so that the shaft, B, can be turned by hand. A neat and accurate job is produced.



Fixture for stamping cylindrical work.

## Standard Ball Bearing Electric Drills, Grinders, Polishers and Buffers



**HEAVY DUTY GRINDER**

G. E. 40 Degree Motor and Push Button Control. Four S. K. F. Ball Bearings. Nickel Steel Armature Shaft. Made in 5, 7½ and 10 H. P. sizes.



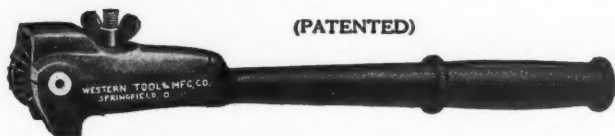
**GENERAL ELECTRIC UNIVERSAL MOTOR DRILLS**

G. E. Universal Motor, S. K. F. Ball Bearings. Gears made out of chrome-nickel steel and run in grease. Trigger switch. Made in ¼", 5/16", 3/8", ½", 5/8", ¾", 1" and 1¼" capacity in steel.

*Write for Late Catalog*

**THE STANDARD ELECTRICAL TOOL CO.**  
ESTABLISHED 1912 CINCINNATI, OHIO

## Champion Emery Wheel Dresser



(PATENTED)

**ALL-STEEL, LATEST AND BEST**

We have evolved an emery wheel dresser that is correct mechanically and will out-wear a dozen of the cheaper types of dressers. The only dresser that runs in an oil bearing.

Let us have your order and do your emery wheel dressing economically and efficiently.

*Catalog Upon Request*

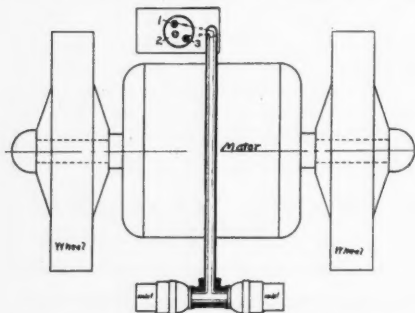
**The WESTERN TOOL & MANUFACTURING CO.**  
SPRINGFIELD, OHIO

*Toolholders, Expanding Mandrels, Shop Furniture, Etc.*

## Lighting the Tool-Grinder Automatically

By A. R. FINCH

AS THE tool-grinder is generally considered the simplest machine in the shop, it is usually the most abused. It requires little room and is, therefore, frequently found in a corner that could be used for little, if anything, else. The tool-grinder in our shop stood in such a corner, away



Arrangement for automatically lighting a tool-grinder.

from the windows and without any artificial lighting, until the lathe and shaper hands registered a kick. To meet their demands, two lights were attached to the grinder in such a way that they were switched on and off automatically.

Our grinder is of the type that has the grinding wheels mounted on the ends of the motor shaft. It is equipped with a G. E. starter and push button. We tapped into a 4-inch box at the foot of the feeder conduit and led a  $\frac{3}{8}$ -inch conduit away from the box to the front of the wheels where a tee and two close nipples were attached, a nipple pointing toward each wheel. To the nipples were attached two standard light sockets. The feeder to the motor was tapped and the sockets were wired in series, which was neces-

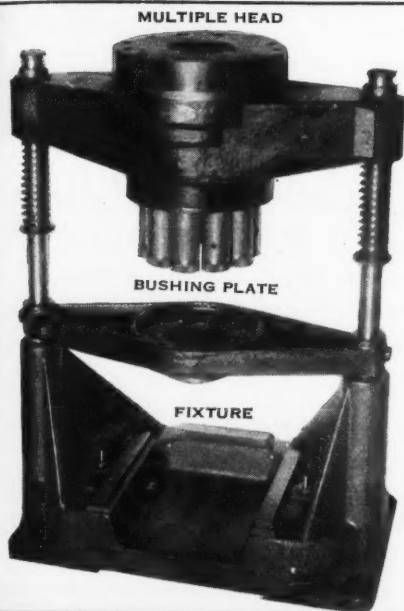
sary as we wanted to use 110 volts for the lights, while the circuit is a three phase, three wire, 220 volt system. To obtain the right voltage, we tapped one live wire—shown as No. 3 on the diagram—and the neutral wire of the circuit—No. 1 on the diagram. This arrangement gave us 220 volts at single phase so by wiring the sockets in series we had 110 volts at single phase.

When the switch is thrown in to start the grinder, the lights being on the same circuit, are automatically lighted; when the machine is stopped, the lights are automatically turned out. Thus the lights are burning only when the grinder is in use, and they act as a signal when the grinder is left running.

## Oil Systematically

The lack of a few cents' worth of oil at the right time may cause many dollars' worth of damage to the bearings and shafts of an expensive machine. The large amount of damage that may result from improper attention to a single bearing in the matter of lubrication makes it advisable to place the responsibility for oiling the machines and shafting on certain individuals, and it should be made a part of their duties to oil all machines and shaft bearings at regular intervals. It is a bad policy to leave the oiling of the machines to the operators, especially if the machines are used by various mechanics. It is human nature for each man to leave the job of oiling the machine for someone else, and the result is that the oiling is neglected altogether.

Mention MODERN MACHINE SHOP when writing advertisers. You will benefit by the co-operation.



## Why Guess About Methods and Cost of Increased Production

*"Krueger"*

### STANDARDIZED

Multiple Head } held in positive  
Bushing Plate } and perfect  
and Fixture } alignment for  
Drilling, Reaming, Boring, Tapping

### OUR SKILLED TOOL ENGINEERS

Will be pleased to furnish complete data and submit quotations on the equipment best suited to your purpose.

**H. R. KRUEGER & CO.**

439 EAST FORT ST., DETROIT, MICH.



## The New *Levolver* Fixture Switch

**C**ONTROL your shop lighting units individually. Install a better lighting system and lower production costs, cut out spoilage and accidents, improve the quality of the product and decrease labor turnover. The new Levolver Fixture Switch is easily installed and saves labor costs, extra conduit and wall switch.



**McGILL**  
MANUFACTURING CO.  
*Electrical Specialties of Quality*  
ESTABLISHED 1904  
VALPARAISO • INDIANA



# Keep Your 2 Bucks!

**J**UDGING from the storm of two-dollar bills, checks and money orders that have been coming in lately, we have been hitting the nail on the head pretty regular. That's fine; we like to know that we are giving our readers what they want and something that they can use, but — **WE DON'T WANT YOUR MONEY.**

¶ The idea seems to prevail among many of our readers that **MODERN MACHINE SHOP** is a paid circulation magazine. Undoubtedly that idea was fostered by the subscription price that is printed on the front cover, and every mail is bringing in legal tender in various forms from readers who want to make sure that they receive every copy of the book. As this is not in line with our policy, we have to return the money, which makes a lot of extra work for the office force.

¶ This magazine is being sent, without charge, to the machine shop executives throughout the country. We don't want your money; your good-will is enough, and you can repay us many times over if you will give our advertisers a chance to bid for your business when you are in the market for machinery, tools, or equipment. The two-dollar price is put on the cover in order to better enable us to keep the magazine out of the hands of those whom we feel are not directly interested in machine shop practice but if you are a machine shop superintendent, foreman, or other mechanical executive, all we want is your name, title, company, correct address and your co-operation. Keep the money!

¶ **NOTE THE COUPON ON PAGE 66.**



**"HOPKINS"**  
PREFERRED  
EQUIPMENT

**Series "C"**  
**Double-  
Acting**

## AIR CYLINDER Cut-Cost Equipment!

When you invest in the "HOPKINS" Series "C" Double-Acting Air Cylinder you make your first good investment for 1929. This cylinder cuts production costs and saves labor on Chucking Machines, Punch Presses, Clamping Fixtures, etc.

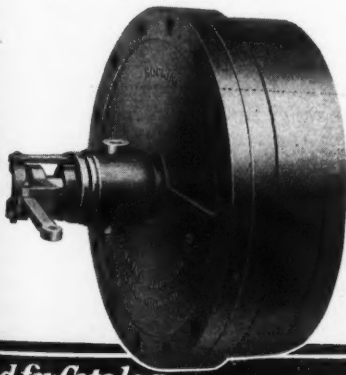
Economical use of compressed air is not the sole virtue of these improved cylinders. Simple construction and ease of operation are also primary features.

This cylinder operates by a handle with a connecting rod attached to the distributor. Air-valve and two pipe connections are discarded. New box pistons use every bit of air; dead air space being eliminated. Total number of packings are reduced to 5, and are automatically sealed by compressed air. Adjustable packing glands are eliminated.

*Send for complete Catalog today!*

**THE TOMKINS-JOHNSON CO.**  
620 MECHANIC STREET  
JACKSON, MICH., U.S.A.

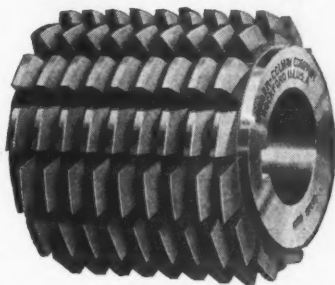
*Also Manufacturers of Chucks, Die  
Sinking Milling Cutters, Work Stands,  
Special Equipment, Etc.*



*Send for Catalog*

SERVICE  
*Is Our Motto*

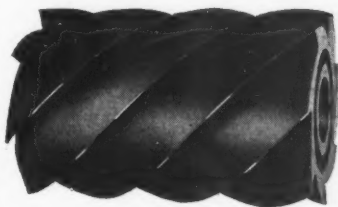
QUALITY  
*Our Creed*



**GEAR HOBS**

*and*

**"BETTER CUTTERS"**



*by*

**BARBER-  
COLMAN**

*of*

**ROCKFORD**

**T**HESE Small Tools are built for long hours of steady use... to stand the battering of a heavy feed and emerge triumphant... to hew steadily to the limit line beneath a chattering mountain of chips... Quality to the core... strength and sturdiness ever dependable.

**BARBER-COLMAN  
COMPANY**

General Offices and Plant—Rockford, Ill., U. S. A.

## MODERN Machine Shop

Published Monthly at  
128 Opera Place, Cincinnati, Ohio

By

DON G. GARDNER - - - - Publisher  
HOWARD CAMPBELL - - - - Editor

1929

**A**S the greatest happiness comes as a result of creative effort, the publishers of MODERN MACHINE SHOP hope that the New Year may bring to each of our readers an opportunity for the greatest effort of which he is capable. The happiness that accompanies the feeling of having found one's place in the world—of having been brought together with the best opportunity for which one is fitted—is second only in importance to the happiness that is to be found at one's own fireside.

This year will undoubtedly be the most progressive of a progressive age. Manufacturing efficiency will be increased by the development of new and better tools and methods; better products will be turned out at, in many cases, lower costs; more labor-saving machinery will be designed to take the drudgery out of every-day tasks. Opportunities will be opened up on all sides for the executive who is posted on the uses and advantages of modern methods and equipment, and who is trained beyond the actual necessities of his job.

In planning the editorial program of MODERN MACHINE SHOP for the coming year, the editor has selected or planned every article on the basis of its practical and educational value to the reader. If we can bring our readers into closer touch with each other, and thus promote the exchange of useful ideas; if we can, by telling

how the work is handled in some of the best-equipped shops, help to raise the operating efficiency of the industry, our year will have been a success.

### Machine vs. Cutting Tool

**T**EMPORARILY, at least, the war between the machine and the cutting tool appears to be over. It all started with the development of high-speed steel, which created a demand for machines having greater strength and faster speeds. Machines were built with the capacity to burn the tools, and then better tools were made. And so, for several decades, the war has gone on.

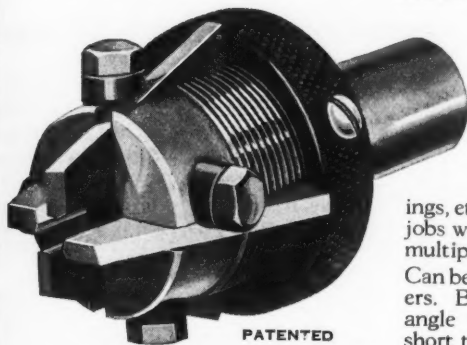
Now, however, a cutting-tool material has been produced which will not only cut the hardest of steels, but which, according to Dr. Samuel L. Hoyt, of the Research Laboratory of the General Electric Company, will cut threads on a glass rod and drill holes in rock and concrete. The material is composed of tungsten and cobalt, and is called "Carboloy."

Laboratory tests have shown that a tool made of Carboloy can be used to machine a block of quenched high-speed steel in the shaper. In making turning tests in the lathe, running at a speed of 200 feet per minute, the edge was burned off a high-speed tool in sixteen seconds, while the Carboloy tool was still holding up and going good at the end of an hour. The surface of a chilled iron casting, containing sand, presents no difficulties for the tool, and nickel steel is cut at a speed which brings the point of the tool to a bright red heat, without any apparent ill effects.

A cutting-tool material with which all of these things can be done will unquestionably effect revolutionary changes in many of the methods in use in the metal-working industries. The development of these changes will be interesting.

## Genesee Adjustable Hollow Mill

Made in 7 different styles



*A Genesee Adjustable Hollow Mill can be made for every job*

WRITE FOR CATALOGUE

**GENESEE MANUFACTURING CO., Inc.**

ROCHESTER, NEW YORK

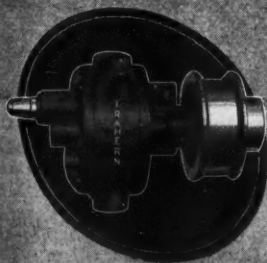
Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

REG. TRADE MARK  
**TRAHERN**  
REG. U.S. PAT. OFF.

## CIRCULATING PUMPS



### TRAHERN PUMPS ELIMINATE CIRCULATING TROUBLE

Trahern Rotary Gear Pumps supply a steady flow of coolant to the cutting edges on all kinds of metal working machines.

Trahern Pumps are positive in action resulting in a flow entirely free from pulsation, can be furnished either as one way or reversible types, with or without automatic relief valve, and for belt or motor drive.

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**GEO. D. ROPER CORP.**

ROCKFORD, ILLINOIS

## New Shop Equipment

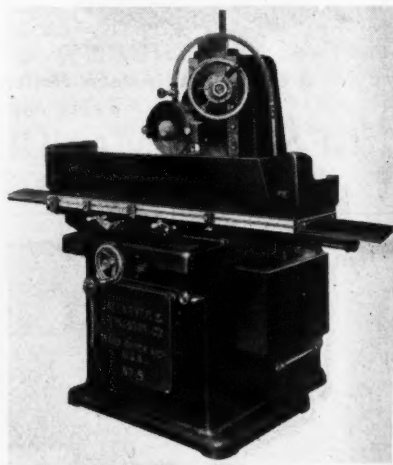
### Grand Rapids No. 5 Hydraulic Feed Surface Grinder

The Gallmeyer & Livingston Co., Grand Rapids, Michigan, has developed a surface grinder, known as the No. 5, in which gearing of every nature in the movement of the saddle and table has been eliminated, making it impossible for the ground surface of the work to show chatter or "gear tooth" marks. The table is reciprocated by means of an oilgear hydraulic feed which can be varied from practically nothing to 55 feet per minute, the feed being controlled by means of a handle at the front of the base. The oilgear also operates the cross-feed mechanism, which may be set to operate at each end of the table stroke or at one end only, and to feed either in or out. The amount of cross-feed for each reciprocation of the table is adjustable.

The machine base is cast in one piece, weighing more than 1,600 pounds, which provides a secure ground work for the rigidity which is built into the entire machine. The spindle head is a very heavy casting, and is fitted to the vertical ways with extreme care and accuracy. It carries an extra heavy spindle with a minimum of overhang for the wheel. The spindle bearings are of the highest grade of bronze, oiled from a generous reservoir, and are easily adjustable for wear. The front bearing is 2 inches diameter by 8 inches long, with an auxiliary rear bearing 1 3/4 inches diameter by 5 inches long. The spindle is of the highest grade material, heat treated. Both wheel bearing and elevating screw are located directly in the center of the vertical

ways, thus avoiding side strains in elevating. The elevating screw is of generous size, 1 1/2 inches diameter, operating in a long bronze nut on top of the main frame.

Aside from the method of operating the table, the most unique feature of the machine lies in the method of

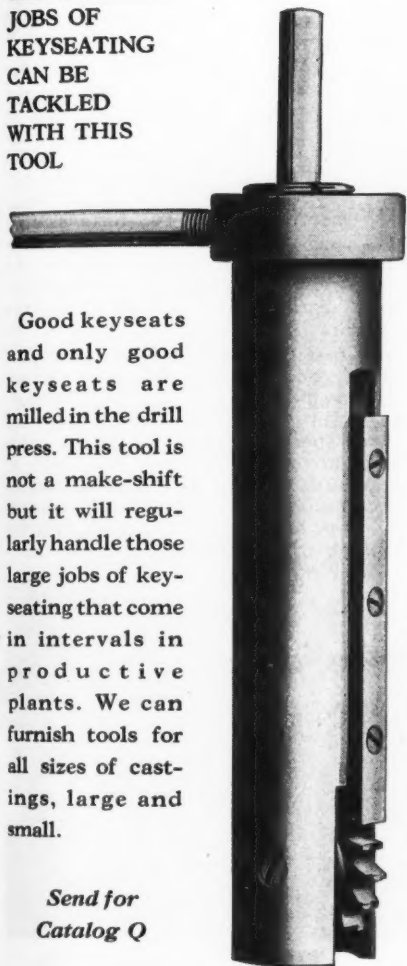


Grand Rapids No. 5 Hydraulic Feed Surface Grinder

raising and lowering the wheel head. For rapid adjustment, used in raising and lowering the head a considerable distance, the large hand wheel is used. This wheel imparts action, through a worm and worm gear, directly to the elevating screw. The wheel is graduated in quarter-thousandths, with a moveable pointer which can be set for convenient reading. Fine adjustments are obtained by the use of the knurled hand knob in the center of the large wheel, the knob controlling a back-

# LET'S GO

THE BIGGEST  
JOBS OF  
KEYSEATING  
CAN BE  
TACKLED  
WITH THIS  
TOOL

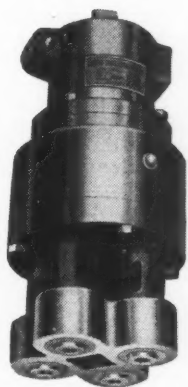


Good keyseats and only good keyseats are milled in the drill press. This tool is not a make-shift but it will regularly handle those large jobs of keyseating that come in intervals in productive plants. We can furnish tools for all sizes of castings, large and small.

*Send for  
Catalog Q*

## NATIONAL MACHINE TOOL COMPANY

2271 Spring Grove Avenue  
CINCINNATI, OHIO, U. S. A.



## Multiple Units

### *From Single Drills*

Designed to fit any type of drill press, a U. S. Drill Head converts any single spindle drill into a multiple unit quickly.

No time wasted making adjustments—spindles are fixed. Any number of holes, fifty if necessary, can be drilled as easily as one.

We will design a U. S. Multiple Drill Head to meet your individual requirements. Tell us your needs. Address

## The United States Drill Head Co.

1954 Riverside Drive  
Cincinnati, O., U. S. A.

geared action to the elevating mechanism. The disc in the center of the hand wheel has a graduated ring dial which can be set at zero in relation to the pointer mounted on the spoke of the large hand wheel. When the knob is turned, both wheels turn, thus obtaining the effect of a Vernier. By this means it is easy to obtain readings in ten-thousandths, the ten-thousandth graduations being over  $\frac{1}{8}$  inch apart.

The standard spindle construction provides for carrying wheels 10 inches in diameter by either  $\frac{3}{4}$ -inch face or 1-inch face. Variations from standard can be taken care of on special order. This machine can be furnished either belt-driven with countershaft or motor-driven with self-contained motor drive and arranged for either wet or dry grinding.

### Norton Type S 24-Inch and 30-Inch Floor Grinder

The Norton Company, Worcester, Mass., is offering a combination high speed floor grinder that can be equipped with hoods for using either 24-inch or 30-inch diameter wheels. The design hinges around the use of a motor mounted in the base, which makes it possible to use any standard alternating or direct current motor so that repairs, when necessary, can be easily and quickly made. Overlapping steel boiler-heads that comply with the Safety Code for wheels operated at 9,000 s. f. p. m. are used for wheel protection guards.

The machine is compact, massive, and of simplified design. The base is of heavy cast iron, covered so as to allow plenty of foot room for the operators. Protection hoods of overlapping steel boiler-heads  $\frac{3}{8}$ -inch thick, to accommodate either 24-inch or 30-inch diameter wheels can be furnished

as required. The hoods are hinged and movable to compensate for wheel wear, the movement being controlled by rack and pinion gears and a ratchet wrench. They can be locked in position or released by means of a cam and lever.

Adjustable combination spark deflectors and protection hoods for the operators are furnished, making it possible to positively control the amount of wheel exposure. Sheet metal exhaust connections are streamlined with the hoods. Work rests are supported from the base casting and are adjustable in two directions to meet any condition that may be imposed. Two double row adjustable ball bearings are provided for the spindle.

A speed of 9,000 s. f. p. m. is provided for new wheels, and driving equipment, as follows, is optional: (a) Multiple (5) Vee belts allowing three speed changes; (b) Silent chain with no speed change. Any type of standard A. C. or D. C. motor can be accommodated. For 30-inch wheels, 15 h. p. motors are specified and for 24-inch wheels, 10 h. p. motors. Lub-



Norton Type S 24-inch and 30-inch Floor Stand

rication of the entire machine is accomplished through four Alemite connections on the top of the base casting. Flexible metal hose from two of these connections provide for lubricating the motor bearings.



# STEEL FORGINGS

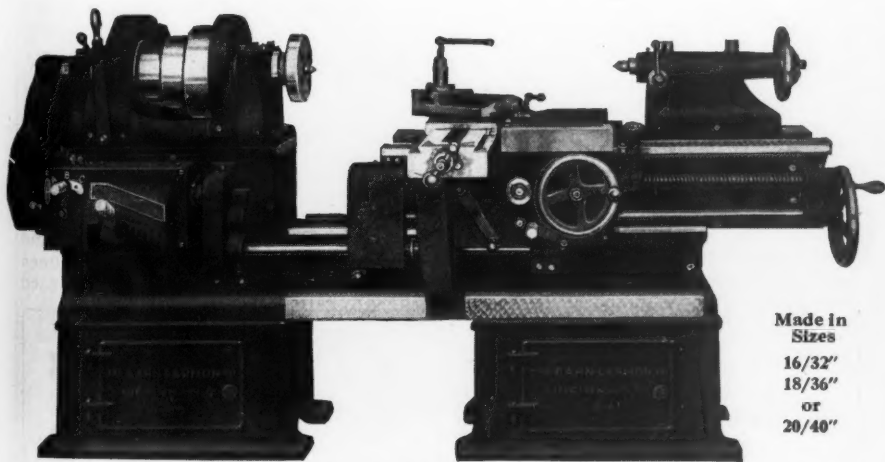
*Service*

*Gear Blanks*



Manufacturing forgings of special alloy steels requires skill. Our work is all done by men who know steels and know how to fashion them into forgings that fit your specifications to the letter. Unquestionably, you can profit through the skill, the care, and the knowledge we have of forging. Forgings rough turned if desired.

THE STEEL FORGINGS COMPANY :: :: CINCINNATI, OHIO



Made in  
Sizes  
16/32"  
18/36"  
or  
20/40"

## Rahn-Larmon 18/36" Extension Bed Gap Lathe

A lathe for large or small swing work, ready at all times. Requires no extra rigging up. Takes different distances between centers.

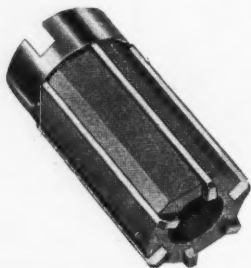
Belt driven or with nine speed all geared motor driven head. Tell us what your requirements are and let us quote you.

THE RAHN-LARMON CO.

2935 Spring Grove Ave., Cincinnati, Ohio

## Conradson Inserted Blade Reamer

The illustration shows the Conradson Inserted Blade Reamer, which is being marketed by the Conradson Tool Corporation, 2114 Indiana Avenue, Chicago, Ill. The production of



Conradson Inserted Blade Reamer

this reamer incorporates a radical departure from the usual and conventional method of making such tools in that the body is of non-ferrous metal. The metal used in the body is a development of several years of study and experiment and has the tensile strength, hardness, and ductility to hold the blades in place under all working conditions. The tool can be operated at high speeds and temperatures without the body being distorted or affected in any way by the heat. The blades are of high-speed steel, solidly anchored in the body without the use of screws or pins. The reamer can be furnished in sizes from 1 $\frac{1}{8}$ -inch up to 3 inches.

## Oxweld Helmet Goggles

Accessories for welding and cutting, recently added to the line of the Oxweld Acetylene Co., 30 East Forty-second Street, New York City, are the Oxweld Cap and Skeleton Type Helmet Goggles.

The No. 9 Cap Type Goggles consist essentially of a strong fiber cap, to which a pair of goggles are attached by means of fiber links. The goggles can be readily raised over the forehead and lowered over the eyes with one hand. The bridge is adjustable and is covered with rubber insulation. Replaceable lenses, in the same size and colors as are supplied in Oxweld No. 6 goggles, are used, the colored lenses being protected by cover lenses of clear glass. The No. 10 Skeleton Type Goggles are the same except that the goggles are attached to a lattice skeleton cap. Both styles

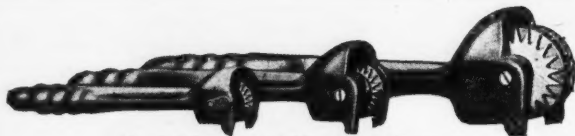
Below—Oxweld No. 9 Cap Type Goggles.



Above—No. 10 Skeleton Type Goggles.

are provided with leather straps at the rear for head-size adjustment.

These Cap and Skeleton Type Goggles furnish adequate protection and are very durable. They have been found, by welders who have used



No. O-1-2 Desmond Huntington Dressers

We are headquarters for all types of Grinding Wheel Dressers and Cutters, also Diamond Hand Tools and Nibs. Write for Catalogue M.

**The DESMOND-STEPHAN MFG. CO., URBANA, OHIO**

## Grinding Wheel Dressers

## DETROIT SEMI-AUTOMATIC DRILLING MACHINES

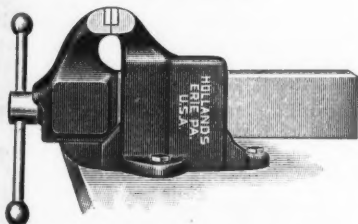
Drills  
900  
to  
1200  
holes per  
hour.

Capacity—No. 60 to 3/4-in. Drills. Standard Fixtures will handle round or hex. stock. Five spindles, cam control. Unsurpassed for speed, accuracy and low cost operation. Over 1800 in successful operation.



**DETROIT MACHINE TOOL CO.**  
5055 Woodward Ave., Detroit, Mich.

## HOLLANDS VISES



A line of individuality and merit, that is the result of over forty years of concentrated effort to produce Vises that will meet the most severe service demands.

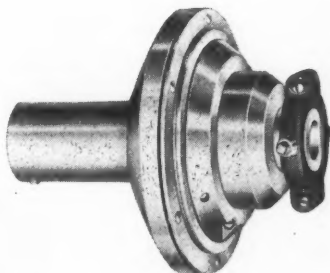
Strenth, rigidity and durability are the three qualifications that have been attained by good design, workmanship and manufacturing facilities.

Write to us for prices and catalog

**HOLLANDS MFG. CO.**

Established 1887

344 E. 18th St. Erie, Pa.



The Conway Disc Clutch is the last word in friction clutches:

*Entirely enclosed*  
*Inherently balanced*  
*With under-slung levers*  
*Large lever ratio*  
*Accessible, accurate adjustment*  
*Easy engagement—quick release*  
*Drag-free idling*  
*Centripetal action*  
*Helped instead of hindered by centrifugal force*  
*Steel discs*  
*Chrome-nickel forged levers*  
*Full length bearing for loose member*

It's the first progressive departure in the design of Disc Clutches in many years. Investigate Conway Clutches.

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**The Conway Clutch Co.**

1959 W. 6th St., Cincinnati, Ohio

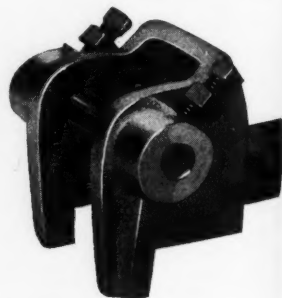
"There's a kick in the click of an efficient drive."

them, to be extremely comfortable and convenient.

### Desmond-Stephan "Perfected ZZ" Emery Wheel Dresser

The Desmond-Stephan Manufacturing Co., Urbana, Ohio, is now mar-

ket of the dresser, which is one inch wide, dresses the grinding wheel on the shearing principle and with a minimum of abrasion. The segments are equally spaced and will maintain this spacing without filling up until completely worn out. The holder is made



"Perfected ZZ" Dresser disassembled, showing construction.

keting the "Perfected ZZ" emery wheel dresser shown in the illustration. The dresser comprises a 14-inch safety holder, carrying a set of three manganese composition segments. The face

with a safety hood which protects the workman from accident, and an adjustable set screw and lock nut hold the shaft firmly in position, thus adding to the life of the tool.

## Again We Thank You!

With this, the first issue of 1929, MODERN MACHINE SHOP makes its bow in a new dress and with the addition of a number of new pages—both editorial and advertising. Again we want to express our thanks for the fine co-operation that you have given us. By letting us or our advertisers know when you were in the market for machinery, tools, or equipment, you have put us in first place as a business-producing medium, and we are going to reciprocate by giving you, throughout the coming year, an editorial program in which the best editorial material available will be incorporated. This is your magazine—edited for your benefit. We will be glad to have any comments or criticisms you may care to make.

Correct any errors in your name, title, or address, and return to

### MODERN MACHINE SHOP

128 OPERA PLACE

CINCINNATI, OHIO

Name..... Title.....

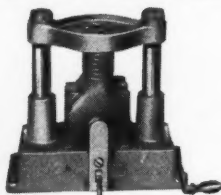
Firm.....

Street No.....

City..... State.....

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## FAST and DEPENDABLE



A DRILL jig must work fast, clamp easily and release easily — but clamp *securely*. SIEWEK RAPID DRILL JIGS are simple, safe, adapted to all kinds of drilling, and positive clamping is assured. The cushion clamping principle requires no back pressure for clamp to set. Standard sizes in stock, special jigs to order. Write today for catalog.

*Some desirable territory still open  
for representatives*

**THE SIEWEK TOOL & DIE COMPANY**  
10230 Woodward Ave. Detroit, Mich.

## TWENTIETH CENTURY BALANCING TOOL



*Always  
on  
the  
level*



The most practical, sensitive and inexpensive device manufactured for balancing pulleys, cones, armatures, fly wheels, polishing wheels, etc. Will set anywhere and is easily portable. In sizes up to 24,000 pounds capacity.

*Ask for the Bulletin*

**Sundstrand Machine Tool Co.**  
ROCKFORD, ILL.

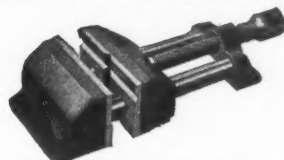
## SHELDON Milling Machine Vises



Furnished Both Plain and With Swivel Base.  
SPECIFICATIONS AND PRICES:

No.	Width of Jaws	Depth of Jaws	Jaws Open	PLAIN VISE		SWIVEL VISE	
				Wt., lbs.	Price	Wt., lbs.	Price
3	3 1/2"	1 3/8"	2 1/2"	15	\$16.00	25	\$20.00
4	4 1/2"	1 5/8"	3 1/2"	30	\$20.00	45	\$24.00
6	6 1/2"	2"	4 1/2"	70	\$30.00	90	\$40.00
8	8 1/2"	2 1/2"	7"	160	\$45.00	225	\$60.00

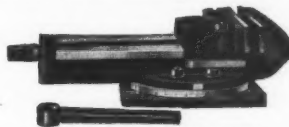
## Sheldon Drill Press Vises



Guide Bars are Hardened and Ground.  
SPECIFICATIONS AND PRICES:

No.	Width of Jaws	Depth of Jaws over Guide Bars	Full Depth of Jaws	Jaws Open	Wt., lbs.	Price
D 4	4 1/2"	1 5/8"	3"	4"	15	\$12.00
D 6	6 1/2"	1 3/4"	3 1/2"	6"	35	\$18.00
D 9	9"	2 1/2"	4 1/4"	9"	70	\$24.00

## Sheldon Shaper Vises



SPECIFICATIONS AND PRICES:

No.	Size of Jaws	Vise Opens	Bolt Hole Spacing*	Wt., lbs.	Price
1	12" x 2 1/2"	12 1/2"	7 1/2"	175	\$120.00
2	14" x 2 3/4"	13 1/2"	8 1/2"	240	\$135.00

\*Distance between holes can be changed without additional charge.

Write for Catalog Describing Full Line of SHELDON Tools For the Machine Shop.

**SHELDON MACHINE Co.**  
3251 Cottage Grove Avenue CHICAGO, ILL.

## For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

**Turret Lathes and Tools:** Illustrated book describing Cincinnati Acme Turret Lathes and Screw Machines, and showing a variety of tools and fixtures for use with these machines. The Acme Machine Tool Co., 4955 Spring Grove Ave., Cincinnati, Ohio.

**Broaching By Modern Methods:** Equipment and tools for finishing round, square or irregular-shaped holes and surfaces by broaching are described and illustrated in a booklet that is issued free by the American Broach & Machine Co., Ann Arbor, Michigan.

**Scraping By Power:** Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

**Machine Shop Accessories:** Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

**Hobs and Milling Cutters:** A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

**All-Geared Drilling and Tapping Machines:** A catalog describing in detail the various types of all-geared, self-feeding, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

**Modern Drilling Equipment:** Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

**Automatic Oiled Die Sets:** The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

**Bowsher Balancing Way:** Gears, pulleys, fly-wheels, emery wheels, and other rotating parts should be properly balanced. This work can be done quickly and accurately on a balancing way that is described in a bulletin issued by The N. P. Bowsher Co., South Bend, Indiana.

**Bradford Unit Type Drill Heads and Tapping Heads** are described and illustrated in a bulletin published by the Bradford Machine Tool Co., 659 Evans Street, Cincinnati, Ohio. The bulletin also describes useful applications of these heads.

**Bradford Precision Lathes:** Precision Lathes for the tool room and for general manufacturing purposes, all-geared and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

**B. & S. Catalog No. 138:** This book contains complete descriptions and illustrations of the milling machines, grinding machines, tool and surface grinders, automatic gear cuttings machines, automatic screw machines, milling attachments, screw machine attachments and tools, end, side, and inserted tooth milling cutters, gear hobs, micrometers, calipers, squares, level protrators, vernier height gauges, dial gauges, wire, thread and drill gauges, and other machines and tools manufactured by the Brown & Sharpe Manfg. Co., Providence, R. I. Sent free upon request.

**Gears of All Kinds** are described and illustrated, with specifications, in Catalog 80 which has been issued by the Chicago Stock Gear Works, 105-9 S. Jefferson St., Chicago, Ill. Copy sent free on request.

**Drilling Machinery:** Circulars describing all types and sizes of radials, uprights, and gang drills for every class of work may be had by writing to The Cincinnati Blackford Tool Co., Oakwood, Cincinnati, Ohio.

**Gear Data:** The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various types and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

**Rapid Traverse Planers:** Cincinnati Hypo Planer, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

**Shaper Progress:** An illustrated catalog describing the various types of shapers made by the Cincinnati Shaper Co., Cincinnati, Ohio, and including descriptions of Cincinnati Shapers in use in different kinds of plants.

**Cisco Engine and Tool Room Lathes,** manufactured by the Cisco Machine Tool Co., 1785-69 Elmore St., Cincinnati, Ohio, are fully described in their catalog. This catalog also includes descriptions of their Radial Drill, Tapping Machine, and Special Attachments.

**Handbook For Drillers:** The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

**Inserted Blade Reamers:** A new type of reamer with high speed steel blades, designed to reduce cutting costs and give longer service, is described in a bulletin that will be sent without charge upon application to the Conradson Tool Corporation, 2114 Indiana Ave., Chicago, Ill.

**Dis-, Expansion and Compression Clutches:** The various types of clutches and their uses are discussed in an illustrated booklet that is issued by The Conway Clutch Co., 1959 West Sixth Street, Cincinnati, Ohio.

**Die Makers' Supplies:** A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Dush Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

OTHER PUBLICATIONS LISTED ON PAGES 70 AND 72.



# LUFKIN

"RAPID READING"  
MICROMETERS

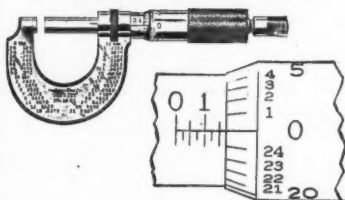


Illustration shows new method of marking the sleeve; every thousandth numbered. It makes reading quicker, easier, and more positive.

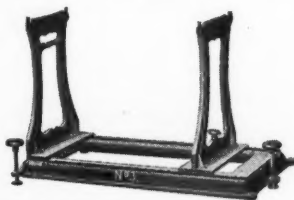
Ask your tool dealer to see them  
Send for Catalog No. 3

**THE LUFKIN RULE CO.**

SAGINAW, MICH.

## For Sure Balance—

an absolutely level and solid "Way" is necessary



## BOWSHER "Balancing Ways"

are brought to an absolute level in ten seconds. No revolving parts.

The edges or "knives" upon which the work is tested are ground true, and are mounted upon the planed "ways" of a heavy bed or frame.

Standards adjustable to suit length of arbor.

Three sizes for floor—one for bench use

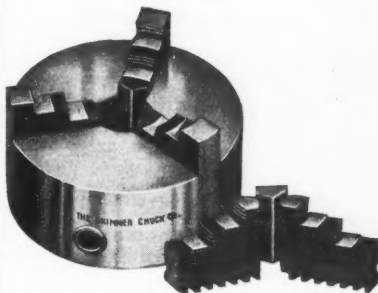
Send for Catalog "H"

The N. P. Bowsheer Co., South Bend, Ind.

# SKINNER

Universal  
Geared Scroll

# CHUCKS



THE Jaws of a Skinner Universal

Geared Scroll Chuck are moved simultaneously by a Scroll threaded disc or plate. This scroll is revolved by the pinion gears to which the wrench is directly applied. The jaws are made of steel carefully heat treated with raised and ground steps and nicely fitted to the Chuck body.

The solidity of construction, simplicity of operation, and great gripping power of the Geared Scroll Universal Chuck have commended them for use on production work.

Catalog 40-M on request.

**THE SKINNER CHUCK COMPANY**

NEW BRITAIN, CONN. U.S.A.

**The Perfected Dresser:** A new type of grinding wheel dresser which operates on a shearing principle and dresses a wheel better and quicker is described in a bulletin that will be sent without charge by The Desmond-Stephan Manfg. Co., Urbana, Ohio.

**Quantity Drilling:** A semi-automatic multiple spindle drilling machine which is designed to produce the maximum of drilled holes in medium or small parts, is described in a pamphlet that is published by the Detroit Machine Tool Co., 5055 Woodward Ave., Detroit, Michigan. Sent free upon request.

**Interchangeable High Production Tools:** Catalog No. 28, issued free by the Eclipse Interchangeable Counterbore Co., 7410 St. Aubin St., Detroit, Michigan, describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

**Silent Gears of Steel:** Gears built up of thin steel laminations so that the teeth flex under impact, thus cushioning the shock, are described in Circular G-6, issued by the Flexible Engineering Corporation, 10 East 43rd St., New York, N. Y.

**Formica Silent Composition Gears:** A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

**Fosdick Drills:** This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

**Modern Grinding Equipment:** The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Galmeyer & Livingston Co., 336 Straight St., S. W. Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

**Adjustable Blade Cutters:** Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

**Saving Time by Disc Grinding:** A book that tells how production costs can be reduced by the use of modern disc-grinding equipment, and which describes and illustrates the latest types of machines used for this work, has been issued by the Gardner Machine Company, Beloit, Wis. A number of illustrations of jobs in operation, together with complete production data, are included.

**Greaves-Klusman Lathes:** A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

**Drilling and Grinding Electrically:** Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

**Vises and Pipe Tools:** The bench, machine and pipe vises, pipe cutting and threading tools, babbitt lathes and melting pots made by the Hollands Manufacturing Co., 344 E. 18th St., Erie, Pa. are described and illustrated in a booklet that is issued free by the firm mentioned.

**Modern Milling Equipment:** A book describing and illustrating in detail all the parts of various types of milling machines and showing a number of ways of handling milling jobs will be sent free to the readers of this magazine by the Kearney & Trecker Corporation, Milwaukee, Wis.

**Standardized Jigs and Fixtures:** Information concerning standardized jigs and fixtures, also all kinds of special equipment for production, can be had by writing to H. R. Krueger & Co., 439 East Fort St., Detroit, Mich.

**Cutter and Tool Grinding:** A book that tells how to grind tools and cutters accurately and which also describes and illustrates the different types of LeBlond Universal Tool Room Grinders will be sent free upon request. Address: The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

**Lehmann Lathes:** Details of the outstanding features of Lehmann Lathes are given in a catalog published by the Lehmann Machine Co., 3560 Chouteau Ave., St. Louis.

**Air-Operated Work-Holding Devices:** A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

**Rapid-Reading Micrometer:** A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

**Time Saving Machine Equipment:** How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

**Lamp Guards:** The various types and kinds of lamp guards made by the McGill Manufacturing Co., Valparaiso, Ind., for factory use are described in a catalog that will be sent free upon request.

**Accuracy in Internal Grinding:** The latest methods of producing accurately-ground holes are described in a booklet which also describes and illustrates the internal grinders made by the Micro Machine Co., Bettendorf, Iowa. Sent free upon request.

**Roller Bearing Radial Drills:** The application of Timken roller bearings in the design of modern radial drilling machines is discussed in a bulletin describing "Mor"-Speed Radial Drills, published by the Morris Machine Tool Co., Cincinnati, Ohio.

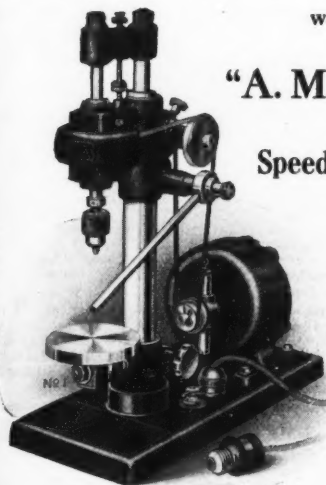
**An Outline of Economical Small Drilling:** The subject of small-hole drilling is discussed in a booklet that is published by Adolph Muehlmann, Fifth and Elm Sts., S. E., Cincinnati, Ohio. The booklet also describes the outstanding features in the construction of the A. M. Sensitive Drilling Machine.

**"The 'Hole' Story in One Word"** is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Nato" multiple drilling and tapping machines.

**Milling Internal Keyways:** A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

**Ball and Roller Bearing Data Sheets:** A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

# for Toolroom or Laboratory



work where quality and accuracy are  
the first consideration, the

## "A. M." Sensitive Drilling Machine

is unequalled. Built for

**Speed :: Accuracy :: Rigidity :: Durability**

We will send this machine to any  
responsible firm for

**10-days free trial!**

*Send blueprint or sample so that we can  
determine size of machine desired. If not  
adaptable to the work, it may be returned  
at our expense.*

Ask us for "An Outline of Economical  
Small Drilling"

**ADOLPH MUEHLMATT**

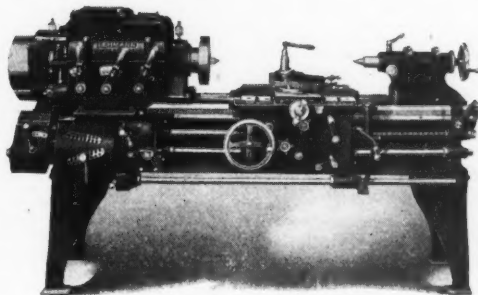
Fifth and Elm Sts., S. E., Cincinnati, O.

# "Lehmann Lathes"

**TWO STYLES**  
Three Step Cone  
and 16-Speed  
Geared Head

**5 SIZES**

16/18 1/4"  
18/20 1/4"  
20/22"  
22/24 1/4"  
24/27 1/4"



**ACCURATE  
POWERFUL  
TOOLS  
EMBODYING**

the most modern  
ideas in design  
and construction. Their  
performance is  
their best in-  
dorsement.

**Ask Any User**

**CATALOG ON REQUEST**

**LEHMANN MACHINE CO.**

3560 Chouteau Avenue, ST. LOUIS, U. S. A.

**"Tool Room Grinding"** tells how to sharpen milling cutters and how to grind drills, taps, reamers, lathe and planer tools, and dies. A number of drawings and photographs are shown, showing how to hold the tools for grinding, and the kinds of chips that should be produced by properly-ground tools, etc. Published by Norton Co., Worcester, Mass.

**Grinding Wheel Information:** A booklet which tells how grinding wheels are made and graded, and which give instructions for mounting wheels, operating speeds for different kinds of work, instructions for truing and dressing, and other information has been issued by the Norton Company, Worcester, Mass. Sent free upon request.

**Correct Cutter Grinding:** How cutter costs can be reduced and more production per grind of cutter obtained is told in Booklet "E," published by The Osterlein Machine Co., 3319 Colerain Ave., Cincinnati, Ohio. Sent free upon request.

**"Ohio" Shapers and Planers:** The latest types of shapers and planers manufactured by The Ohio Machine Tool Co., Kenton, Ohio, are described and illustrated in a series of bulletins that have been issued by this firm. All the latest features of these machines, such as automatic lubrication, instantaneous feed, centralized control, and gear box, are described in detail. Free upon request.

**Self-Tapping Sheet Metal Screws:** Screws which are threaded and hardened in such a manner as to enable them to cut their own threads as they are screwed into sheet metal assemblies are described in a folder which is published by the Parker-Kalon Corporation, 192-196 Varick St., New York City, N. Y. Sent free upon request.

**Making Blue Prints:** Methods and equipment for producing blue prints at a minimum cost in all sizes of plants, from the small shops to the largest production plants, are described in Catalog M-55, issued by The C. F. Pease Company, 855 North Franklin St., Chicago, Ill.

**Drawing Instruments:** A wide and complete range of drawing instruments and draughtsman's tools of all kinds are described in Catalog DI-55, issued free by The C. F. Pease Company, 855 North Franklin St., Chicago, Ill.

**Tracing Paper and Cloth:** The C. F. Pease Company, 855 N. Franklin St., Chicago, Ill., has issued a sample book containing samples of the various kinds of tracing papers and cloths marketed by this firm. Copy free upon application.

**Engines, Turret, and Gap Lathes** are described in a series of bulletins that have been issued by The Rahm-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

**"The Heart of the Machine Tool"** is the title of a folder which describes the construction and method of operation of the Trahern Coolant Pump, manufactured by the Geo. D. Roper Corporation, Rockford, Ill. Copy free upon request.

**Automatic Lubrication:** Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruhman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

**Safety Grinding Wheels:** The complete line of grinding wheels made by the Safety Grinding Wheel & Machine Co., Springfield, Ohio, is described in Catalog No. 11, which is issued by this firm. The book also contains instructions for operating grinding wheels, tables of grinding wheel speeds, pulley calculations, and other information for the user of grinding wheels.

**Engineering and Manufacturing Service:** A complete engineering and manufacturing service for manufacturers who are not equipped to handle all of their own designing, experimental, or production work is described, with illustrations of the equipment available, in a bulletin that is issued by The Steel Products Engineering Co., Springfield, Ohio.

**Saving Time With Small Tools:** A line of time-saving small tools, including "Use-Em-Up" drill sleeve, "Wear-Even" chucks, collets, cutters, reamers and tap holders, counterbores, upfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

**Equipment For the Shop:** Vises for the bench, drill press, milling machine or shaper; angle plates; adjustable clamps, jacks and other tools for the machine shop, are described and illustrated in a booklet that is published by the Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill. Copy free upon request.

**Rapid Drill Jigs:** How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Slewak Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

**"Chucks and Their Uses"** is the name of a book which contains a full description of the different kinds of chucks and suggestions for the proper care of chucks, and tells how chucks should be fitted to lathes. It also contains a number of suggestions for general shop practice. Sent free upon application by The Skinner Chuck Co., New Britain, Conn.

**Electric Drilling and Grinding Equipment:** A book that is issued by The Standard Electric Tool Co., 1938 West Eighth St., Cincinnati, Ohio, tells how time can be saved, better work done, and the efficiency of the shop improved by the use of electrically-driven drilling and grinding equipment. Free upon request.

**Material-Handling by Modern Methods:** Modern methods of storing and transporting materials in the shop are discussed in a bulletin which also describes the various types of lift trucks manufactured by The Stuebing Cowan Company, 320 East Court St., Cincinnati, Ohio. Sent free upon request.

**Twentieth Century Balancing Tools:** A practical, sensitive and inexpensive device for balancing pulleys, fly wheels, and other round parts is described and illustrated in a bulletin that will be sent without charge by the Sundstrand Machine Tool Co., Rockford, Ill.

**Save Cutting Oil:** How cutting oil can be separated from chips and then reclaimed by the use of a centrifugal chip "wringer," is told in a bulletin that is issued free by the Tolhurst Machine Works, Troy, N. Y.

**Chuck With Air:** How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Meachanic St., Jackson, Mich. Sent free upon request.

**Walden Cam Vise:** A vise that centers and clamps the work with one stroke of a hand lever, and which can be used as a quick-acting jig for pieces of any shape, is described in a circular that will be sent free by Frik Uhlenhaut, 200 Congress St., Boston, Mass.

**Multiple Drilling With a Single-Spindle Drill:** Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

**Electrically-Driven Portable Tools:** The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

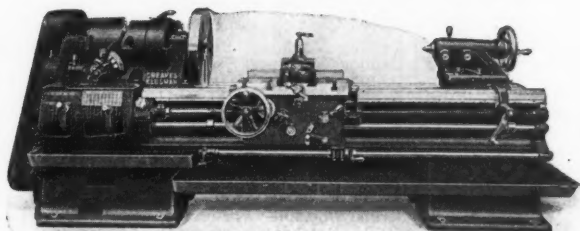
**Shop Furniture:** A catalog describing and illustrating all kinds of shop furniture, including benches, vices, steel stands, foremen's desks, chip trucks, steel racks for bar stock, steel tote boxes, and other equipment will be sent free upon application to The Western Tool & Manufacturing Co., 1620 East Pleasant Street, Springfield, Ohio.

# A Good Lathe Costs No More

in the end—and you will have had the services of a first-class machinetool through the years. *Built for SERVICE and ACCURACY, the*

**G-K HEAVY DUTY ENGINE LATHE HAS**

**Flexible  
Motor  
Drive**



**Single  
Lever  
Control**

Reinforced bed and carriage.  
Spindle center back of center line of bed.  
Patent tailstock clamp, insuring alignment.  
Feed rod and lead screw supported at both ends of apron.  
Double plate box form apron.  
Longitudinal feed stops in both directions.

Geared quick change feeds.  
Tumbler self-lock'g for reversing lead screw.  
Steel gears in apron with cast iron frictions bolted on.  
Apron control for starting, stopping and reversing.  
Hardened heat treated transmission gears.  
Steel gears throughout entire lathe.

**THE GREAVES-KLUSMAN TOOL CO., Cincinnati, O.**

## Hollow Bored Forgings and Steel Shafts

**BORED STRAIGHT AND TRUE TO SIZE**

You can be sure of prompt delivery, fair prices and high quality when you order forgings for piston rods, clutch shafts, lathe spindles, rams, hydraulic cylinders, etc., from us. Send prints for estimate.

**AMERICAN HOLLOW BORING CO., 1035 W. 19th St., Erie, Penna.**

## Pease Drawing Paper Catalog

In order to aid the buyer in the intelligent selection of drawing papers and cloths, the C. F. Pease Co., 855 North Franklin Street, Chicago, Ill., has put out a book containing sample sheets of the different kinds of drawing and tracing papers and cloths manufactured by this firm. Each sample carries the name, number and other information, and the book contains a price list.



## GEARS

**All Kinds—Small—In Stock**

The most accurate made and prices reasonable. We carry a complete line of gears in stock for immediate shipment. Can also quote on special gears of all kinds. Send us your inquiries.

*Write for Catalog 80*

**CHICAGO STOCK GEAR WORKS**  
105-9 S. Jefferson St. Chicago, Ill.

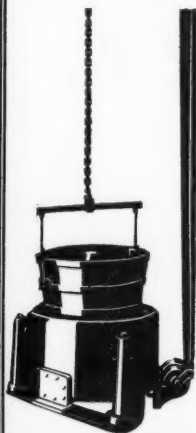
## Check For Information Wanted

If you are interested in prices or information on any of the equipment listed, check the item, write your name, firm name, title and address on the margin, tear out the page and send it to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. We will see that you are supplied with the information desired.

- |  |   |  |
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| <input type="checkbox"/> Abrasive Polishing Grains | <input type="checkbox"/> Drilling Machines, Sensitive | <input type="checkbox"/> Parallels                   |
| <input type="checkbox"/> Arbors                    | <input type="checkbox"/> Drilling Machine Heads       | <input type="checkbox"/> Pipe-Cut'g & Th'd'g Mach'y  |
| <input type="checkbox"/> Babbitt Metal             | <input type="checkbox"/> Drilling Mach., Automatic    | <input type="checkbox"/> Pipe Tools                  |
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| <input type="checkbox"/> Belt Dressing             | <input type="checkbox"/> Drills, Portable Pneumatic   | <input type="checkbox"/> Punches, Hand               |
| <input type="checkbox"/> Bench Legs                | <input type="checkbox"/> Drills, Ratchet              | <input type="checkbox"/> Punches, Power              |
| <input type="checkbox"/> Benches                   | <input type="checkbox"/> Drills, Twist and Flat       | <input type="checkbox"/> Punch Holders               |
| <input type="checkbox"/> Bending Machines          | <input type="checkbox"/> Files and Rasps              | <input type="checkbox"/> Racks, Cut                  |
| <input type="checkbox"/> Blue Printing Machinery   | <input type="checkbox"/> Filing Machines              | <input type="checkbox"/> Reamer Holders              |
| <input type="checkbox"/> Bolt and Nut Machinery    | <input type="checkbox"/> Forging Machinery            | <input type="checkbox"/> Reamers, Adjustable         |
| <input type="checkbox"/> Bolts and Nuts            | <input type="checkbox"/> Furnaces, Forging            | <input type="checkbox"/> Reamers, Solid              |
| <input type="checkbox"/> Bolts, Stripper           | <input type="checkbox"/> Furnaces, Heat Treating      | <input type="checkbox"/> Riveting Machines           |
| <input type="checkbox"/> Boring Bars               | <input type="checkbox"/> Furniture, Machine Shop      | <input type="checkbox"/> Rules, Steel and Wood       |
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| <input type="checkbox"/> Boring Mills, Horizontal  | <input type="checkbox"/> Gauges, Dial                 | <input type="checkbox"/> Saws, Metal                 |
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| <input type="checkbox"/> Bushings, Bearing         | <input type="checkbox"/> Grinding Mach., Cylindrical  | <input type="checkbox"/> Screw Machines, Automatic   |
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| <input type="checkbox"/> Calipers                  | <input type="checkbox"/> Grinding Machines, Cutter    | <input type="checkbox"/> Screws, Cap, Set or Mach.   |
| <input type="checkbox"/> Centering Machines        | <input type="checkbox"/> Grinding Machines, Drill     | <input type="checkbox"/> Shafting                    |
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| <input type="checkbox"/> Chucking Machines         | <input type="checkbox"/> Grinding Wheels              | <input type="checkbox"/> Sleeves, Drill              |
| <input type="checkbox"/> Chucks, Air-Operated      | <input type="checkbox"/> Grinding Wheel Stands        | <input type="checkbox"/> Springs, Pressure Pad       |
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| <input type="checkbox"/> Chucks, Lathe and Planer  | <input type="checkbox"/> Hoists, Chain or Electric    | <input type="checkbox"/> Tap Holders                 |
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| <input type="checkbox"/> Clutches, Friction        | <input type="checkbox"/> Jacks, Planer                | <input type="checkbox"/> Tapping Machines            |
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## Save Cutting Oil



A Tolhurst Chip Wringer handles 3 to 4 loads per hour and reclaims 6 to 15 gallons per load. This reclaimed oil pays for the machine in a very short time. Write for catalog which illustrates and fully describes the various sizes available.

*Write today*

**Tolhurst  
Machine Works  
Incorporated  
TROY, NEW YORK**  
New York Office:  
183 Madison Ave.  
Chicago Office:  
8 S. Dearborn St.

## BROACH for Accuracy—Economy!



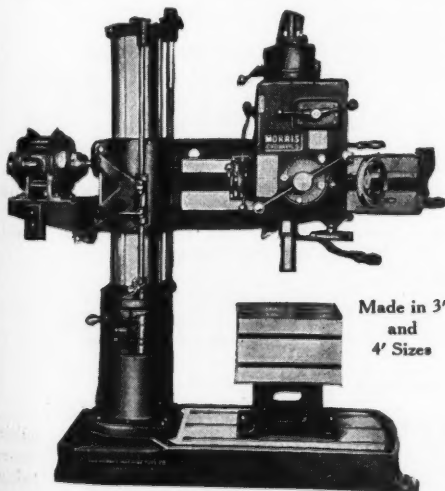
Let us show you how to finish more holes—more accurately—and at less cost.

### The American 2-Ton Hydraulic Press

is recommended for broaching connecting rods and work that comes within the 2-ton range. We manufacture presses from 2 tons to 150 tons pressure, also all types of broaching tools.

**AMERICAN BROACH & MACHINE CO.**  
ANN ARBOR, MICHIGAN

## MORRIS MOR-SPEED LUBRICATION



Made in 3'  
and  
4' Sizes

In addition to using hardened alloy steel gears, multiple splined shafts of alloy steel, multiple disc clutch and all geared drive, the entire head and back bracket runs in oil.

This is just another instance of employing modern machine construction to give longer and care free service.

The oil pump runs at constant speed and forces oil thru a sight feed oiler to reservoir at top of head from which all moving parts are lubricated by gravity.

*Our bulletin "Mor-Speed" is full of modern construction details.*

*Write for one.*

TIMKEN



BEARING

EQUIPPED

**MORRIS MACHINE TOOL CO.**  
CINCINNATI, OHIO



# Riff=Raff Ravings

By GEO. ALEXANDER MANN  
Raver-in-Chief

## Aw Hush

Our work is never finished,  
We plug from sun to sun,  
But the bill collector's,  
He is always dun—

One reason people are livin' longer  
is cause the doctors are makin' operation  
prices prohibitive—

Wisdom is mostly knowin'  
What not to do—

## His Mistake

"There's a run in your sock,"  
He said to Miss Hatch;  
She said, "I don't wear 'em—  
That there is a scratch"—

Another padlock simply means another  
increase in the cover charges.

## Not Yet

Wimmin may kid 'emselves that  
they're hellers at the old flivver wheel,  
but you haven't heard o' any o' the  
railroads draftin' 'em for engineers—

## One on the Ear—Two on the Jaw

For Xmas from maw,  
Paw got a box,  
An' fer good measure,  
A pair o' socks—

## 'Twas A Riot

A noisy party?  
Well, I should think;  
Gosh, I could hardly  
Hear myself drink—

Real pleasure come in our desires—  
not in the gratification thereof—

## Danny Dum

"If cows don't get drunk,"  
Said Freshman Danny Keefe,  
"I ask where tha Dickens  
Do they get their corned beef?"

The only things great or moral in  
politics are the issues—

## Answer Me That

The Publishers' Syndicate says:  
"We have no officials who look as im-  
portant as Mussolini"—Huh—How  
'bout Cincy's traffic cops?—

## A Hot Come-Back

The barber said unto the man,  
"I shaved you yesterday;"  
He said, "No, I wuz in a wreck,  
Tha's why I look this way"—

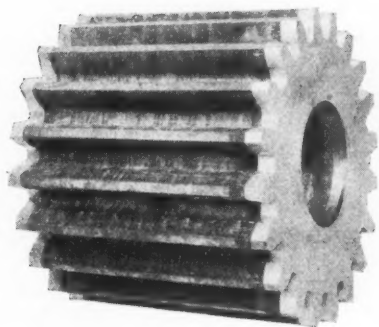
To get the multitude to trail to your  
door you gotta make an awfully good  
mouse trap—but mos' any ol' kinda  
hootch'll turn the trick.

The traffic cop says,  
If ignorance is bliss  
Gosh what a blissful  
World is this.

## AIN'T UT THA TROOF?

There'd be fewer birds speakin'  
seven languages if a guy had to learn  
to say something in one before takin'  
up the other six.

# **FABROIL GEARS ARE SILENT**



## **PRICE LIST?**

### **THE CINCINNATI GEAR CO.**

**1825-41 READING ROAD**

**CINCINNATI, OHIO**

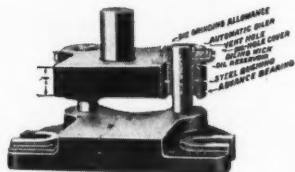
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# BAUMBACH

Automatically Oiled

# DIE SETS



Standardized die sets, embodying many exclusive features, and a listing of 70,000 stock sizes afford a service that is unsurpassed.

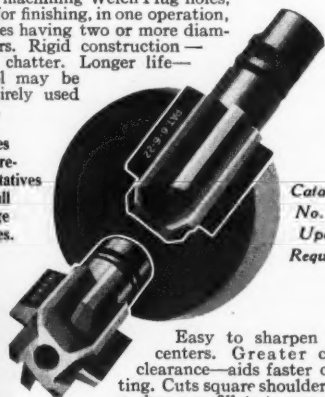
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Send for New 120 Page Catalog*

**E. A. Baumbach Mfg. Co.**  
1806 S. Kilbourne Ave. Chicago, Ill.

## Combined Core Drill and Facer

for machining Welch Plug holes, or for finishing, in one operation, holes having two or more diameters. Rigid construction—no chatter. Longer life—tool may be entirely used up.

Sales representatives in all large cities.



Catalog  
No. 28  
Upon  
Request

Easy to sharpen on centers. Greater chip clearance—aids faster cutting. Cuts square shoulders—no burrs or fillets to remove. Eliminates extra operations.

**ECLIPSE** INTERCHANGEABLE COUNTERBORE COMPANY  
DETROIT — MICHIGAN

# “LOGAN”

## Standard No. 3

AIR-OPERATED

# Arbor Press



**Saves Time  
Saves Labor  
Increases Production**  
*Made in 10 Sizes*

This is one of a complete line of Air-Operated Work-Holding Devices described in our

**Catalog R-23**  
*Ask For It!*

**LOGANSPORT MACHINE CO.**  
LOGANSPORT, IND.

# How Six "Cle-Forge" Drills Increased Production—

## from 850 to 2600 pieces per day.



Job consists of sinking six No. 31, wire gauge, holes in straight row on .156-inch centers. Drill press is of semi-automatic type, designed to drill all six holes in gang. The Six No. 31 CLE-FORGE HIGH SPEED DRILLS rotate at 6,000 r. p. m. Feed is .0007 inch per revolution, or about 4.2 inches per minute. Cylinder is about 1/2-inch outside diameter, with 1/2-inch hole drilled off-center parallel to the axis. Drills first penetrate the thin wall and then the thick one at point diametrically opposite.

When drilling is done, chuck automatically withdraws piece, and discharges as it revolves again to loading position.

Greater economy was desired by a prominent Eastern manufacturer in the gang drilling of 6 close-spaced holes through a brass pin tumbler lock cylinder.

Ordinary carbon drills, No. 31 wire gauge, were unable to produce holes of uniform size—had an average life of only 400 holes per drill—and cost \$1.95 per 1,000 cylinders. Total cost of both drills and press amounted to \$12.54 per 1,000 cylinders.

When CLE-FORGE HIGH SPEED DRILLS were introduced an instant improvement was noticeable. Not only were the holes absolutely uniform and accurate, but production was speeded up and costs materially reduced.

With a high average life of 11,000 holes per drill, CLE-FORGE DRILLS lowered drill cost from \$1.95 to 10c per 1,000 cylinders—and cut total drill and press cost from \$12.54 to \$3.56 per 1,000 cylinders!

Not only was production jumped from 850 to 2600 cylinders per day, but—

The net annual saving, on this job alone, resulting from the use of CLE-FORGE DRILLS, amounted to \$1,167.50!

**T**HIS complete performance report is absorbingly interesting—and we predict you will find it so, too. We have it in Digest No. 56, and shall be glad to send you a copy upon request.



**The CLEVELAND TWIST DRILL COMPANY**  
CLEVELAND  
NEW YORK-CHICAGO-LONDON  
SAN FRANCISCO

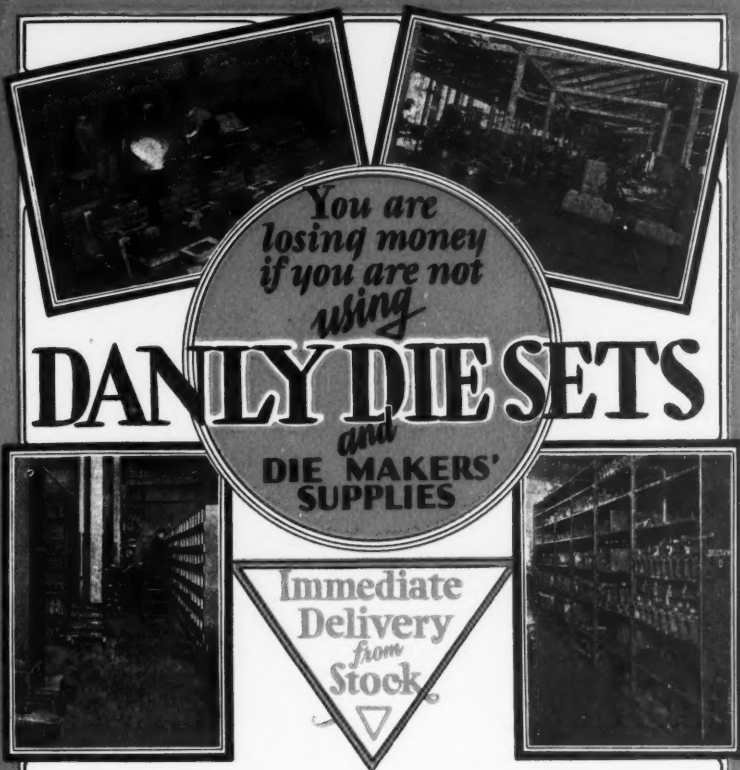
Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Counterdrills; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

Illustration of brass pin tumbler lock cylinders. CLE-FORGE HIGH SPEED DRILLS increased production of these cylinders from 850 to 2600 per day, effecting a 71.6% saving in drilling cost!

## 6-Famous Tools







*You are  
losing money  
if you are not  
using*

# DANLY DIE SETS

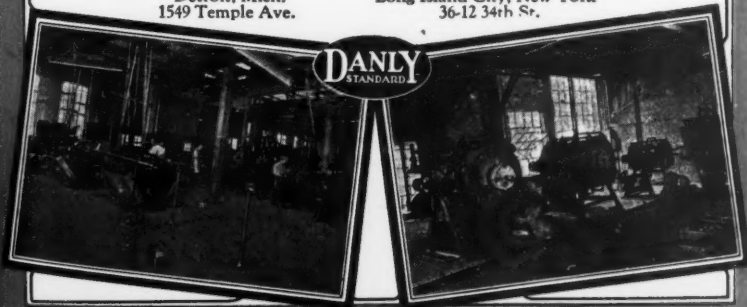
*and*  
**DIE MAKERS'  
SUPPLIES**

**Immediate  
Delivery  
from  
Stock**

**T**HE great Danly plant makes the die sets and die makers' supplies for over 4500 manufacturers of stampings, pressed metal parts, etc. You, too, will save 20-50% in first cost and very much more in production cost by using Danly Service. A far-reaching service for makers of stampings, pressed metal parts and dies. Immediate delivery from stock from nearest warehouse. Ask for new Danly Catalogue. No obligation.

## DANLY MACHINE SPECIALTIES, INC.

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 Detroit, Mich. Long Island City, New York  
 1549 Temple Ave. 36-12 34th St.



**DANLY**  
STANDARD



## ***Impartial Tests Show U. S. Most Economical, Dependable***

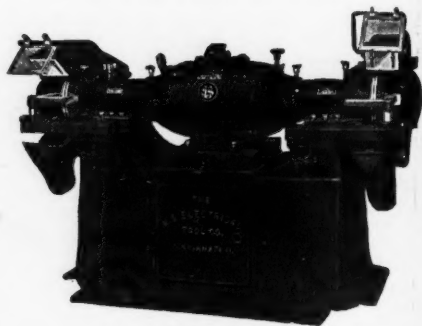
One of the biggest railroads in another country needed a large number of grinders. Their engineers tested several makes privately. The U. S. Heavy Duty *Adjustable Speed* Grinder won on several points.

### ***Wear 24-inch Wheels Down to 10 Inches***

One of these points—distinctive with U. S. because it is patented—is that you can use 24-inch wheels down to the flanges! This is possible because the U. S. maintains a peripheral speed of approximately 5500 feet per minute regardless of wheel wear. Included are four heavy duty SKF Ball Bearings, one-piece

nickel steel spindle, powerful A.C. or D.C. motor of 40 degree centigraderating and with 100% overload capacity—plus many other desirable features. Before you buy, it will pay you to get all the U. S. facts.

*Ask Your Jobber or Write Us*



**PATENTED**

**THE UNITED STATES ELECTRICAL TOOL CO.**

*Oldest Builder of Electric Drills and Grinders in the World*

**2471 WEST SIXTH STREET**

**CINCINNATI, OHIO, U. S. A.**